THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. MAY 21, 1896. CHICAGO, ILL. NUMBER 21.

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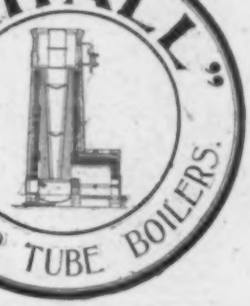

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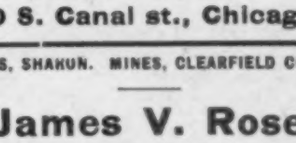
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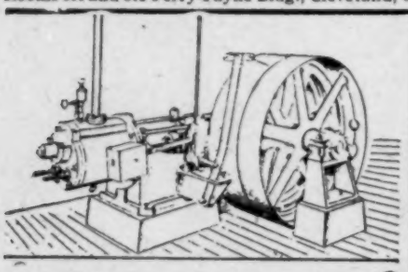

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THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. MAY 21, 1896. CHICAGO, ILL. NUMBER 21.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

In its length and breadth the iron situation shows little change from week to week. In special products, or in particular localities, there may be an occasional ripple of interest, but in general, there is scant business and scant profit. There must be greater consumption than in the early months of last year, but there are more concerns in shape to produce, so that orders are spread thinner. Furnaces in the Mahoning and Shenango valleys are going out, and by the end of the month probably not half the stacks in those districts will be active. Eastern Pennsylvania furnaces, also, are curtailing, and three Lehigh valley stacks have gone out since the first of the month, with one or two more expecting to do so before June 1. There is nothing else ahead of a number of other producers, if there is no quickening of demand. Mills are operating with short forces in many instances and there will be no long parleying over the question of stopping altogether if the wage scale presented by the Amalgamated Association adds to the burdens mill owners are now carrying. Actual business in the past week has been slow-paced in nearly all materials. In the Central West interest has been aroused by some buying of Bessemer pig on which deliveries extend through the year. One steel company in Ohio is reported to have taken 28,000 tons, at an average price of $12.50 for deliveries to Jan. 1. Another transaction, also by a steel company, takes in a considerable block of metal, the earlier deliveries being at a figure close to $12 in the valleys, with later ones at higher figures. The billet market is dull. Talk of open hearth projects is still rife, and some Indiana gas belt works have announced, on the heels of the acquisition of the Premier Steel Works by tin plate and wire nail interests, that they will build basic furnaces. On the other hand there seems some ground for the report that some of the extensive open hearth work projected in the Pittsburg district by a large interest will be held in abeyance, in view of the condition of the steel market. There is plenty of steel-making capacity—that everybody knows—but there are many finishing mills that will exhaust every resource before tying up to billet contracts which will give them no chance in competition with the big producers. Foundries are still very light buyers of iron. Northern furnaces, both in the East and in the Central West, have felt keenly their handicap in competition with the South, with $2 coke and the higher price for ores. A reduction of 40 to 50 cents in freights, to be effective June 15, will probably be made for Eastern and Central districts, and it will be some slight help to Northern furnaces in holding their regular trade.

THE CLEVELAND DISTRICT.

Sales of ore thus far fall short considerably of the business done up to the third week of May last year. The holding off of some consumers to get a clearer idea of their probable requirements is likely to have its effect upon the vessel situation, and ultimately may lead to a further restrictive policy at Lake Superior mines. If the business in ore that many have figured on is done in 1896, the crowding of much of it into a few months at the latter part of the season is inevitable. Meanwhile the liberal shipments that characterized the early part of last season are not possible with some selling companies. The financing of freights on unsold ore is one problem, and the dock charges on ore that does not go forward from vessel to furnace is another. However, some ore is being sold with every week, and not a few mines have placed the bulk of their probable production for 1896. The curtailment movement among valley furnaces means a check on ore consumption, but the ore trade can as well have it come that way as to have unsold stocks of pig iron piled up in yards. The ultimate effect on the ore trade is the same. A falling off in the grain movement has weakened freights in the past week. From Escanaba both 60 and 55 cents have been done. The Marquette rate is nominally 80 cents, and that for Duluth and Ashland, $1.

Pig Iron. Valley furnaces are yielding to the pressure of the higher price of ore, added to $2 coke, and a market price for pig iron, plainly below cost. In the Mahoning and Shenango valleys, four have blown out since the first of the month and three or four more will follow suit within 10 days. Others that planned similar action are understood to have made considerable sales of iron in the past week. Reports apparently reliable credit one steel company with taking 28,000 tons, deliveries running to the end of the year, and another buyer is said to have contracted for a considerable block of metal, with extended deliveries. All the iron comes from valley furnaces, and while some earlier deliveries are at a lower price, it is said that the average price on iron for third and fourth quarters is $12.50 in the valley. Some of the sales recently made for May and June delivery were as low as $11.80 in the valley, and it is said one transaction shaded this price. Valley producers of foundry irons who have been shut out of Eastern markets recently, owing to $2 coke and low priced Southern irons, may be able to hold their own on the reductions in freight which are proposed, subject to the ratification of the Joint Traffic Association. On foundry irons we repeat quotations of $12.50 to $12.75 on No. 1 and $12.00 to $12.25 for No. 2, Cleveland. Lake Superior charcoal is $13.50 to $14.00, with light present consumption by malleable works.

Finished Material. Building work causes considerable local inquiry for structural material. The Kirk-Christy Co.'s proposed building calls for 500 to 600 tons of steel and a smaller tonnage is involved in several other local projects. The announcement is made of an advance of $2 in beams and channels, or to 1.55c, Pittsburg, and 1.64c, Cleveland. Angles have scarcely held the quoted prices of 1.25c@1.30c, Pittsburg. Plates are unchanged at 1.30c@1.35c, Pittsburg, for tank. The local bar iron trade has not profited to any extent by the B. & O. car order as yet; that for the Lehigh Valley (2,500 cars) goes chiefly to Central Western shops and may add its quota to near-by mills. Bar iron and steel bars are quiet. Valley mills do not follow the wage convention at Detroit with any eagerness. It seems likely that if any advance is made it will result in shut-downs.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1142 MONADNOCK BLOCK, May 20.

Very little business of consequence was placed in this market last week. The only transactions of importance were those in connection with the cars for the B. & O. Road, the most important being the order for the 20,000 axles required. This amounts to about 4,000 tons of steel. The order was placed for the entire amount with the Illinois Steel Co. and this company will furnish to some of the car works the necessary blooms and to others the finished axles. The axles are to be made under contract from the steel company by a Chicago forging works. This is the first time the Illinois Steel Co. has competed for any large lots of axles. The angles and plates for the 1,000 cars to be built by the Pullman Co. amounting to about 300 tons, will go to an Eastern mill. In the general market nothing of importance has transpired and sales have been smaller if anything than in the week before.

PIG IRON.—Both Northern and Southern irons were very quiet last week, no large transactions having been reported. There has been some little inquiry for charcoal iron and one lot of 1,000 tons of Southern charcoal was sold at current quotations. Inquiry for all grades was very light and it is not likely that any large business will be done in this market in the very near future. Deliveries are fairly active, however, and local foundries appear to be doing a reasonably good business. Lake Superior charcoal iron is in light demand, but the furnaces experience no difficulty in securing full prices for anything sold and in fact one furnace company is asking 50c per ton advance over the market quotation. Prices are now made as follows:

Lake Sup. Charcoal	$13 50@14 00	Southern No. 2 Soft	$11 35@11 60
Local Coke Fdy. No. 1	12 25@12 50	South'n Silveries No. 1	11 85@12 35
Local Coke Fdy. No. 2	11 75@12 00	South'n Silveries No. 2	11 60@11 85
Local Coke Fdy. No. 3	11 00@11 50	Jackson Co. Silveries	14 50@16 00
Local Scotch Fdy. No. 1	12 25@12 50	Ohio Silveries No. 1	15 00@15 50
Local Scotch Fdy. No. 2	11 75@12 00	Ohio Silveries No. 2	14 50@15 00
Local Scotch Fdy. No. 3	11 00@11 50	Ohio Strong Softeners	15 00@15 50
South'n Coke No. 1	12 10@12 35	Alabama Car Wheel	16 85@17 35
South'n Coke No. 2	11 60@11 85	Malleable Bessemer	13 25@13 50
South'n Coke No. 3	11 10@11 60	Coke Bessemer	13 25@13 50
Southern No. 1 Soft	11 60@11 85		

BARS.—The only part of the bars required for the B. & O. cars that would naturally come into this market is that for the cars to be built by the Pullman Co. As this concern rolls its own bar iron the material was not contracted for in the open market. General business is fair but no sales of any consequence have been made: Quotations are unchanged as follows: Common iron, 1.30c to 1.35c; guaranteed, 1.35c to 1.40c; soft steel bars from strictly billet stock, 1.40c to 1.45c.

RAILS AND TRACK SUPPLIES.—A good business is reported by the local mills in rails, all of it in small lots. There is a fair inquiry for track supplies and one or two good sales were made last week. Quotations are as follows: Rails, $29; splice bars, 1.45c to 1.50c; track bolts with square nuts, 2.05c to 2.15c; hexagon nuts, 2.15c to 2.25c; spikes, 1.75c to 1.80c.

BILLETS AND RODS.—The market is very quiet and no sales of either billets or rods were made last week. It is not expected that the immediate future will show any great increase in the demand. Billets are quoted at the pool price of $21.25. In the absence of transactions no quotations are made on rods.

STRUCTURAL MATERIAL.—Good orders are being received all the time on old contracts but very little new business has come up, none of it of any size. Prices are unchanged, as follows: Beams and channels, 1.65c to 1.70c; angles, 1.45c to 1.50c; plates, 1.50c to 1.55c; tees, 1.65c to 1.70c. Small lots from stock are quoted ¼c to ½c higher.

PLATES.—The market has been quiet and while a few orders of from 50 to 100 tons were taken no large business was closed. Quotations are unchanged as follows: Tank steel, 1.50c to 1.55c; flange steel, 1.75c to 1.80c; fire-box steel 2.35c to 5c; boiler tubes, 65 and 10 to 70 and 10 per cent discount.

SHEETS.—Only a small demand is had for either black or galvanized sheets, and sales last week were light. Quotations are unchanged, at 2.30c to 2.35c for No. 27 black sheets, and 75 and 10 and 5 per cent discount for galvanized.

MERCHANT STEEL.—The week has been quiet, and the demand appears to have fallen off somewhat. Quotations are made as follows: Open-hearth spring, tire and machinery steel, 1.85c to 1.95c; smooth finished machinery steel, 1.65c to 1.70c; smooth finished tire 1.60c to 1.65c; tool steel, 5 50c to 7.50c; specials, 11c and upwards; Bessemer bars, 1.55c to 1.65c.

OLD RAILS AND WHEELS.—No sales of any importance were made last week, and the demand does not indicate an increase of business in the near future. Quotations are nominally as follows: Old iron rails, $15.50 to $16.

SCRAP.—Inquiries for old material are light, and the only transactions closed were small and unimportant. The following are buying quotations furnished by dealers: Railroad forge, $13 to $13.50; dealers' forge, $11 to $11.50; No. 1 mill, $8.25 to $8.50; heavy cast, gross ton, $10; malleable cast, $11.00 to $11.50; axles, $15; cast borings, $5.00; wrought turnings, $6.50; axle turnings, $7.25; mixed steel, $8 to $9; stove plates, $7; heavy melting steel, $10.50 to $11.00.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, May 20.

One or two considerable sales of Bessemer iron for delivery in the third and fourth quarters of the year are the talk of the local iron trade; beyond which there is no incident to break the dullness that has prevailed in the past two months. The stopping of a number of valley furnaces is taken as an index of the unprofitableness of present prices, but how far this action will affect the general situation will depend upon the call for finished material. Of late, the demand for Bessemer iron has been too meager to permit of judging the situation by ordinary standards. Some ore buying is reported by Pittsburg furnaces, though the leading interest has not yet taken hold.

PIG IRON—A sale of 10,000 tons of Bessemer, and one of 2,000 tons at $12.65 Pittsburg are reported for early delivery. There are reports also of two considerable valley transactions, said to aggregate 40,000 tons, the metal going to steel works in Ohio. For delivery up to the middle of the year, $12 is the reported basis, and for the later deliveries, some of them extending to Jan. 1, 1897, $12.25 and $12.50, in the valley. Offers are current of from $12.50 to $13.00, Pittsburg, for shipment over the third quarter, but sellers generally are not willing to entertain these prices. Foundry iron is not in demand. Quotations are $12.25@$12.50 for No. 1, and $11.75@$12.00 for No. 2. Gray forge is a trifle weaker. We quote $10.75@$11.00, and note two sales of 1,000 tons each at $10.75 and $10.90, respectively.

BILLETS AND RODS—There is very little doing in billets. The quotations by middlemen are $19.50 and $19.75, but at these prices there is no demand. One

sale of 500 tons at the pool price, $20.25 delivered, is reported, but the transaction involved a trade for iron. In sheet bars, little is done. A sale of 500 tons was made at $22.75. Wire rods have sold at $26.50.

FINISHED MATERIAL.—Increased inquiry is noted for a few lines of mill products; whether it is only a spasmodic movement will develop later. A contract for 700 tons of steel for a new local hotel has been taken in the week and there is figuring on a considerable amount for outside projects. April was a light month, however in the amount of structural material rolled by the mills. Beams and channels are held at 1.45c with some talk of a slight advance in the near future. Angles are quoted 1.25c@1.30c. Recent contracts for railroad equipment have brought some orders for plates into the market. Quotations are 1.30c@1.35c for tank steel. The merchant trade in pipe continues light, but gas and oil pipe are fairly active. The quotation to jobbers on black pipe is still 57 and 67, with four 10s and 5 per cent on butt and lap weld respectively, and on galvanized, 50 and 55 per cent respectively, with four 10s and 5 per cent. There is no improvement in bar iron. The pool price of 1.20c in the valley for common is maintained. Steel bars are 1.15c, Pittsburg, half iron extras, though this has been shaded. The sheet trade is narrowed down to the six weeks left of the first half of the year. Going business is only fair. We quote No. 27 at 2.15c to 2.25c. Galvanized sheets are 75 and 10 to 75, 10 and 5 off, with good inquiry.

SCRAP.—Quoted prices can be shaded, it is well understood, but very little is doing. Steel rails are held firmly at $13.50 and heavy mixed steel is quoted $13 to $13 50. The large additional open hearth capacity building at important local works is counted on to give a stronger market later, for material for melting. We quote No. 1 railroad wrought scrap at $12.50; old iron rails $16 to $16.50; wrought turnings, $8; cast borings, $7 to $7 50.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Buffalo. The most noticeable features to report from this district this week are that consumption has unquestionably dropped off, and although some few concerns report plenty of work, the majority are running light. All are inclined to be hopeful for the future, yet sales are few. Both Northern and Southern furnaces are firm at present prices, and not a few state that as soon as they work up last year's ore purchases they will be compelled to do one of three things, obtain higher prices for their product, run at a loss, or go out of blast. Local furnaces are busy, now that the Erie canal has opened. This has reduced stocks, and there is little, if any, pig iron on hand at the furnaces in this vicinity. We repeat the quotations of last week: No. 1 strong, foundry iron, Lake Superior ores, at $13@13.25; No. 2, $12.50 @ $12.75; Ohio strong softener No. 1, $13@$13.50; Jackson County silvery, $15.25; Lake Superior charcoal, $13.50@$14; Southern soft No. 1, 12.40: Hanging Rock charcoal, $17.

Cincinnati. The previous dullness has been emphasized somewhat during the week under review. The closing of the contracts by the receivers of the B. & O. R. R. for 5,000 cars, together with the placing of other smaller orders for cars, imparted welcome stimulus to the trade. Many prominent manufacturers are figuring on important undertakings, indicating that a large number of enterprises are in embryo. Much of the halting is attributed to the condition of the the national finances, and to the uncertainty of the principles, policies and plans of the political parties on the money question. Not only foreign investors, but many at home await the definite decision of the "powers to be," as to whether their capital will be returned to them in hundred-cent dollars, or depreciated ones, before making their investments. No marked change in present conditions will come probably until the political platforms to be promulgated in Juue and July shall indicate the sentiment of the people on the question. In the week some charcoal iron has been sold for car wheel purposes, but reports come from malleable works of light business. Bar iron is dull, though prices are being maintained. Sheet mills are fairly employed. We quote Southern coke No. 1 at $11; No. 2 at $10.50; No. 2 soft at $10.25; gray forge at $9.50; Tennessee charcoal at $14 to $14.25; Lake Superior charcoal at $15.50.

CONDITION OF BLAST FURNACES OF U. S.*

May 1, 1896.

Location of Furnaces.	Charcoal.					Bituminous or Coke.				
	Total No. of Stacks.	In Blast.		Out of Blast.		Total No. of Stacks.	In Blast.		Out of Blast.	
		Number.	Weekly capacity.	Number.	Weekly capacity.		Number.	Weekly capacity.	Number.	Weekly capacity.
New England	11	.....	.....	11	1089	.....	.....	.....	.....	.....
New York	6	.....	.....	6	731	5	2	3034	3	3335
Pennsylvania	13	1	60	12	924	5	2	2248	3	2390
Pittsburgh	.....	.....	.....	.....	.....	25	23	44736	2	3977
Spiegel	.....	.....	.....	.....	.....	1	1	750	.....	.....
Shenango Valley	.....	.....	.....	.....	.....	16	11	15442	5	4693
Jun. and Con. Vals.	.....	.....	.....	.....	.....	17	10	10652	7	3635
Maryland	4	.....	.....	4	327	5	1	1969	4	4675
Virginia	4	.....	.....	4	210	23	14	9800	9	5411
North Carolina	.....	.....	.....	.....	.....	2	1	104	1	650
West Virginia	.....	.....	.....	.....	.....	4	2	2624	2	1434
Ohio—Mahoning Val.	.....	.....	.....	.....	.....	12	10	13377	2	3090
East, Cent. & North.	.....	.....	.....	.....	.....	17	12	16100	5	7260
Hocking Valley	.....	.....	.....	.....	.....	6	.....	.....	6	2606
Hanging Rock	10	.....	.....	10	875	12	7	2464	5	1150
Kentucky	3	.....	.....	3	865	6	3	1891	3	1280
Tennessee	8	3	880	5	1465	13	6	5506	7	4714
Georgia	3	1	282	2	375	2	.....	.....	2	1360
Alabama	10	2	738	8	1762	39	18	19701	21	12595
Indiana	.....	.....	.....	.....	.....	2	.....	.....	2	275
Illinois	.....	.....	.....	.....	.....	17	13	25591	4	5198
Michigan	19	5	2707	13	4194	.....	.....	.....	.....	.....
Wisconsin	3	1	870	2	470	4	3	3301	1	826
Minnesota	.....	.....	.....	.....	.....	1	.....	.....	1	665
Missouri	1	.....	.....	1	275	2	.....	.....	2	1710
Texas	4	1	140	3	845	.....	.....	.....	.....	.....
Oregon	1	.....	.....	1	280	.....	.....	.....	.....	.....
Colorado	.....	.....	.....	.....	.....	3	1	1437	2	1600
Total (char. and coke)	100	15	5677	85	14687	239	140	180727	99	73639
Total anthracite (New York, New Jersey, and Lehigh, Schuylkill, Upper and Lower Susquehanna and Lebanon valleys.)	126	44	29409	82	38083	.....	.....	.....	.....	.....

SUMMARY.

Fuel.	In Blast. Number.			In Blast. Weekly Capacity.			Out of Blast. Number.		Out of Blast. Weekly Capacity.	
		Month Previous.	Year Previous.		Month Previous.	Year Previous.		Month Previous.		Month Previous.
Charcoal	15	15	19	5,677	5,123	4,118	85	86	14,687	15,162
Anthracite	42	44	34	28,361	29,409	19,951	81	82	38,704	38,083
Bituminous	140	137	123	180,727	177,142	131,215	99	103	73,639	77,902
Total	197	196	176	214,765	211,674	155,284	265	271	127,030	131,147

*The above table is condensed from the *American Manufacturer*. The tables of the *Iron Age* show in blast May 1, 16 charcoal furnaces, with 4,760 tons weekly capacity, instead of 5,677; 178 coke and anthracite, with 183,559 tons weekly capacity, instead of 182 (adding together "bituminous" and anthracite in above), with 210,088 tons weekly capacity. Total 194 active furnaces, with a total capacity of 188,319 tons, instead of 214,765, as above.

THE Pittsburg Bridge Co. has contracted to furnish six iron bridges for the commissioners of Allegheny County.

THE Consolidated Traction Co., of Pittsburg, has purchased land and will shortly commence the erection of its large power house.

THE IRON TRADE REVIEW

DEVOTED TO IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES.

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IRON AND STEEL PRODUCTION IN 1895 OFFICIALLY REVIEWED.

In the current issue of the *Bulletin*, General Manager Swank, of the American Iron and Steel Association, gives the review of the American iron trade in 1895 and in the first four months of 1896, from his annual statistical report for 1895, now in press. As May was the month in which the boom of last year began, the reminiscence is interesting just now, even though the anniversary finds the iron trade with little present prospect of a repetition of the phenomenal movement of last year. After referring in general to the improvement of 1895 in the iron and steel industries, Mr. Swank, says:

"Special reasons contributed to the exceptional activity in these industries. They were the first to feel the shock of the panic of 1893. The prices of iron and steel and of the raw materials of their manufacture had fallen under this shock and under the influence of previous unfavorable conditions to relatively lower figures than the prices of most other products. With steadily falling prices stocks of iron and steel in the hands of consumers had become practically exhausted, in obedience to a well known law. The managers of our railroads had been forced in 1893 and 1894 to exercise the greatest economy in the purchase of rails, cars and locomotives and in the construction of bridges, and this economy could not be continued much longer. Even before the turn of the tide, in 1895, consequent upon the stoppage of gold exports and the adjournment of the 53rd Congress, there had occurred a considerable increase in the demand for structural steel for various purposes, and this demand greatly increased in April and May. Finally, the rates of duty in the iron and steel schedule of the new tariff were not so injurious as the rates in some other schedules. Foreign competition was not, therefore, a factor that would aid in continuing the depression in the home iron and steel market.

"When general trade conditions, therefore, began to improve early in 1895, it required no gift of prophecy to foresee that our iron and steel manufacturers would not only be among the first to experience the quickening touch of the revival, but that they would in all probability be overwhelmed with orders. This is exactly what happened. The railroad companies and other consumers, seeing that the prices of iron and steel would now advance instead of decline, and that the improvement in their own business prospects would justify a more liberal policy, at once began to place orders freely. Soon afterwards all the mills and furnaces that were in a position to accept orders were taxed to their utmost capacity to supply the extraordinary demand for their products. Prices rose from week to week and continued to rise until September, rising most rapidly in August. In September a reaction occurred, and thereafter prices fell steadily until the close of the year, although consumption remained active. This was the iron and steel boom of 1895. It began in May and definitely ended in October. In no other manufacturing industry was there either an extraordinary demand or an extraordinary advance in prices in 1895, although there was a general lifting up of all trade conditions.

"The following incidents of the boom of 1895 are worthy of preservation: During the last half of August and until Saturday, September 7, the price of Bessemer pig iron advanced from day to day at all points of production, the advance at Pittsburg during the three weeks mentioned being fully $3 per ton, or from $14.65 to $17.75. Bessemer billets at once sympathized with the movement in the raw material, and they also advanced $3 per ton in the same period, or from $22 to $25. The lowest prices touched by these two products during the preceding depression were recorded in January, 1895, when Bessemer pig iron at Pittsburg was quoted at $9.95 per ton and Bessemer billets in the same market at $14.60 per ton. The advance in the first named product from January to September was therefore $7.80 per ton, and in billets it was $10.40 per ton."

The following table is given showing the great increase in production of iron and steel in 1895 over 1894:

ARTICLES.—Gross tons, except nails.	1894.	1895.
Shipments of iron ore from Lake Superior	7,748,932	10,438,268
Production of pig iron, including spiegel and ferro	6,657,388	9,446,308
Production of spiegeleisen and ferro-manganese	120,180	171,724
Production of Bessemer steel ingots	3,574,313	4,909,128
Production of open-hearth steel ingots and castings	784,936	1,137,182
Production of all kinds of steel	4 412,032	6,114,834
Production of structural shapes, not including plates	360,305	517,920
Production of plates and sheets	682,900	991,459
Production of all rolled iron and steel, except rails	3,620,439	4,883,438
Production of Bessemer steel rails	1,016,013	1,299,628
Total production of rails	1,021,772	1,306,135
Production of street rails, including above	157,457	163,109
Production of iron and steel cut nails, in kegs	2,425,060	2,129,894
Production of iron and steel wire nails, in kegs	5,681,861	5,841,403
Production of iron and steel wire rods	673,402	791,130
Production of all rolled iron and steel, including rails	4,642,211	6,189,574

"Shipments of Lake Superior iron ore increased 2,689,336 tons over the shipments of 1894, or 34.7 per cent.; the production of pig iron increased 2,788,920 tons, or 41.8 per cent.; spiegeleisen and ferro-manganese, 51,544 tons, or 42.8 per cent.; Bessemer steel ingots, 1,337,815 tons, or 37.4 per cent.; open-hearth steel, 352,246 tons, or 44.8 per cent.; all kinds of steel, 1,702,802 tons, or 38.5 per cent.; structural shapes, 157,615 tons, or 43.7 per cent.; plates and sheets, 308,559 tons, or 45.1 per cent.; Bessemer steel rails, 283,615 tons, or 27.9 per cent.; wire rods, 117,728 tons, or 17.4 per cent.; all rolled iron and steel, including rails, 1,547,363 tons, or 33.3 per cent.

"Included in the production of all kinds of rails in 1895 were 163,109 tons of street and electric rails, against a similar production in 1894 of 157,457 tons, showing an increase in 1895 of only 5,652 tons.

"The production of iron ore in the United States in 1895 has been ascertained for the United States Geological Survey by Mr. John Birkinbine. It amounted to 15,957,614 gross tons, against 11,879,679 tons in 1894, an increase of 4,077,935 tons. Our imports of iron ore in 1895 amounted to 524,153 gross tons, against 168,541 tons in 1894, an increase of 355,612 tons."

Amalgamated Association Convention.

Nearly 250 delegates are in attendance at the annuul convention of the Amalgamated Association of Iron and Steel Workers, which opened at Detroit, on Tuesday. It is reported that 45 lodges have been added to the roll in the last twelve months. The tin plate contingent is stronger than ever, and chiefly consists of Welshmen. The wage scale committee's report came up early, and a committee is now at work on details. It is reported that advances are to be asked in at least two departments, and these are thought to be puddle mills and tin plate mills. The convention is expected to last through ten days.

CHAS. E. POPE & CO., Pittsburg, have opened Cleveland offices, 811–12 Perry-Payne Building, in charge of Wilmer Wickersham. The manufacturers represented are the Juction Iron & Steel Co., Mingo Junction, O.; the Finished Steel Co., Youngstown, O., and La Belle Iron Works, Wheeling, W. Va.

THE LATE THOMAS SEDDON.

Brief mention was made in our issue of last week of the death at Birmingham, Ala., May 11, of Thomas Seddon, president of the Slosss Iron & Steel Co. Mr. Seddon was 47 years years of age, and was born at Richmond, Va. He was the son of James A. Seddon, secretary of war of the Confederate States. After graduating from the University of Virginia, he became a member of the firm of Lee, Seddon & Co., a prominent grocery and importing house of Richmond, Va., where the foundation of his mercantile training was laid. He also spent some time in Louisiana, managing the interests of a large sugar plantation belonging to the Seddon estate. A portion of his life was spent in New York City, where he operated in stocks and bonds in Wall Street. Later, he became identified with the Richmond & Danville Railroad interests, and especially that portion of the line built in Alabama, called the Georgia Pacific railway. His attention was then called to the advantages of the Birmingham district, and he located there in 1887.

Since that time Mr. Seddon has been foremost in all matters pertaining to the iron industry of the South and to the development of the Birmingham district on broad and liberal lines. Identified with the Sloss Iron & Steel Co. as its president since December, 1887, he shaped and controlled its affairs with a masterly hand. The loss to the Birmingham district by his death is irreparable, and the most ardent advocate of its resources and capabilities will be sorely missed from the councils of its representative men.

Unlike most of the managing heads of large corporations, Mr. Seddon was endeared personally to all with whom he came in contact, and therefore his loss becomes individual, a severe one, to each one privileged to know him. Faithful to all trusts, just and liberal in his dealings with all men, he commanded the willing respect and confidence of all classes. He combined gentleness with a bravery that knew no fear, and his friendship was true under all the varying conditions of life.

Personal.

Frederick Shively, superintendent of the Jones & Laughlins mills, Pittsburg, died on May 17.

Geo. T. Oliver, president; W. P. Snyder, vice president; G. L. Brown, secretary and James Collard, treasurer, are the newly elected officers of the Hainsworth Steel Co., Pittsburg.

John W. Townsend, vice president of the Cambria Iron Co., has been a Cleveland visitor the past week.

President Garland, of the Amalgamated Association, was endorsed for commissioner of Allegheny county, by the association's wage committee at its Pittsburg meeting last week.

W. R. Wallis, who has been connected with the editorial department of the Cleveland *World* for the past two years, has accepted the position of traveling representative of the *Age of Steel* and the *Lumberman*, of St. Louis.

Matthew Graff, of Pittsburg, formerly of Graff, Bennett & Co., and at another time of the firm of Reeves, Graff & Woods, died suddenly at Pittsburg, May 19, of apoplexy, aged 61. He was until recently vice president of the Carbon Steel Company.

THE Guaranty Trust Co., of New York, offers for subscription, at par and accrued interest, $1,500,000 first mortgage 20-year 6 per cent. sinking fund gold bonds of the Johnson Company, subscription books to be closed on Wednesday, May 27. The entire issue is $2,000,000, the bonds bearing date of Sept. 1, 1894. The statement of Stephen Little, expert accountant, accompanying the advertisement of the bonds, says the gross earnings of the company in 1895 were $578,372.97, and net earnings (deducting $102,032.12 interest) $476,340.85. In the six years beginning 1890 the average gross earnings of the company were $516,650.55 and net earnings, $476,611.32.

THE Champion Iron Co., Kenton, O., has recently introduced an electro-bronzing and plating department, and will be enabled hereafter to finish fine work at home.

THE Richey Iron & Steel Co., Ironton, O., has been incorporated with a capital of $100,000.

LAKE SUPERIOR IRON MINES.

One of the special steam shovels shipped to the Mesabi range by the Vulcan Iron Works Co., of Toledo, has been in service and has made a good record. It is working in 10 to 15 feet face, the dipper cutting easily through the ore, making three trips a minute and loading a car in two minutes, the car loads averaging six dippers. A train of five cars was loaded in 10 minutes, one of six cars in 12 minutes and one of eight cars in 15 minutes. This is good performance, considering that the dipper each time swings a load of five or six tons of ore. Another shovel, which is at the Mountain Iron, somewhat smaller than the one just referred to, is loading 25-ton cars in 2½ minutes, and a train of 12 cars in 30 minutes, with one move.

It is the intention to mine some ore this year from both the Hamilton and Ludington mines, which are now being unwatered. Much of the Hamilton deposit closely resembles the Chapin ore. The Ludington ore is of high grade, running well up in iron and some of it as low as .02 in phosphorus.

The men at the Chapin mine have asked that the eight-hour system be introduced there, but the management has replied that under existing conditions it does not care to embark on the experiment. Whether any steps will be taken by the men to enforce their request has not yet developed.

S. S. Curry, president of the Metropolitan Iron & Land Co., replying to a letter of the miners' union asking him to co-operate in the movement for the introduction of eight-honr shifts in the mines, says among other things, that while eight hours of well devoted labor is all that should be required of a man, yet to introduce the eight-hour system would be fraught with dangers, chief among them bankruptcy. With 50 per cent. of the men unskilled, he believes that an eight-hour regulation would impose a hardship on them, in denying them the right to work hours enough to make a living such as the law of supply and demand warrants paying to labor Further, he contends, no one district can compete with another that gets more hours of work for less pay.

At the Hale mine, on the Mesabi range, W. E. Dorwin has begun his contract to ship to the Thomas Iron Co. 75,000 tons of ore.

The Auburn Mining Co. has shut down its mine, throwing about 100 men out of work. The mine has about 50,000 tons in stock and this will be shipped at once. No date of resumption is set. Winston Bros. continue stripping operations.

FORMAL resolutions can scarcely express the sense of the foundrymen gathered at Philadelphia last week as to the indebtedness of the foundry interest of the country to those who were instrumental in making the great convention so complete a success. Secretary Evans is remembered first of all for his untiring efforts during the past three months, and for so planning all arrangements that the most was seen and heard in the time at the disposal of the visitors. The charming reception at the Academy of Fine Arts, Wednesday night the lunch of Wednesday noon and the shad dinner of Thursday afternoon, were the formal expressions of the interest of the Foundrymen's Association of Philadelphia in the comfort of its guests, but in a score of lesser ways the visitors were given occasion to remember their stay with pleasure. President Schumann was the ideal presiding officer, tactful, alert and with the situation always in hand. The foundrymen of Philadelphia have the satisfaction of knowing that through this convention they have helped to bring in a new day for the foundry interest in the United States—have, in fact, put it where it will have recognition hereafter as a separate industry, and not, as has been too long the custom to regard it, a mere adjunct of the machine shop.

Capt. E. J. Longyear has discovered ore in his explorations in sections 28 and 29, 58-20 on the Mesabi range. Work on section 28 has shown a considerable ore body. The drill is in 190 feet of ore.

THE Atlantic Iron Co., of New Castle, Pa., is now producing Bessemer iron, instead of gray forge, as heretofore.

NATIONAL CONVENTION OF FOUNDRYMEN.

That Philadelphia, the home of the movement for organization among foundrymen, was the fit meeting place for the national convention of foundry proprietors is abundantly attested by the outcome of the great gathering of last week. Never before have so many members of the foundry trade—widely diversified and sharply competing interests—been brought together in one hall, and never has so positive a conviction been aroused in the minds of foundrymen, of the possibilities of developing this industry through associated effort for the improvement of practice. Considering the unsatisfactory condition of the business with so many foundries, and the fact that even for the Central West the journey to the meeting place was a long one, the attendance was excellent. When the register was finally made up, fully 350 names appeared, and there were some who looked in upon the convention for a single session, whose names were not enrolled. Naturally, Pennsylvania had the largest representation among the States, and Philadelphia, among the cities, showed the largest attendance. It is significant that 23 States were represented, those in the East sending largest delegations, because they had not far to go. As a matter of interest, we have grouped the delegates by States and by cities, so that it may be seen at a glance how the sections and States compared in their representation:

PENNSYLVANIA.

Philadelphia.—F. Schumann, Tacony Iron & Metal Co.; Walter Wood, E. J. Lane and T. L. Morton, R. D. Wood & Co., Howard R. Sheppard, I. A. Sheppard & Co.; H. Rebmann, Godfrey Rebmann and Wm. H. Sauter, G. Rebmann & Co.; James H. Blankley, Blankley Bros. & Co.; John S. Wilbraham, Wilbraham-Baker Blower Co.; Josiah Thompson, J. Thompson &. Co.; Wm. J. Coane, Jos. Dixon Crucible Co.; Arthur W. Howe; Stanley G. Flagg, Jr., and Geo. Flagg, Stanley G. Flagg & Co.; W. W. Stevens, W. W. & R. S. Stevens; Elmer E. Brown, E. E. Brown & Co.; S. F. Givin, Wm. H. Derbyshire, Thos. Pole, W. P. Bement, Bement, Miles & Co.; Chas. James, Henry Disston & Sons; J. H. Pepper and Thos. Hobson, *Iron Age;* Geo. J. Rominger and H. Ruhland, Girard Iron Works; W. H. Pfahler, C. M. Mott, Thos. I. Rankin and A. C. Mott, Abram Cox Stove Co.; Frank R. Jones, Jerome Keeley & Co.; Jno. M. Warner, J. M. Payne and Wm. Dette, Rogers, Brown & Warner; Asa W. Whitney, A. Whitney & Sons; D. J. Matlack, I. P. Morris Co.; F. P. Howe, J. R. Newkirk, Wm. Wharton, Jr., & Co.; C. R. Ellicott, C. R. Ellicott & Co.; James Schleicher; W. J. W. Moore, Leonard Peckitt and James M. Hodge, Crane Iron Works; T. J. Kelly and A. J. Whittingham, Moore, Kelly & Co.; Thillwell R. Coggeshall, Supt. Girard College; Chas. D. Cramp and Jesse Jones, Wm. Cramp & Sons; John H. Glover and Thos. Glover, Glover Bros.; Geo. R. Allen; W. Adams and W. H. Hunt, Wm. Adams & Co.; Andrew Wheeler, Morris Wheeler & Co.; N. Mager, Jr., A. & P. Roberts Co.; Thos. E. McDermott, Kavanagh & McDermott; Joseph Richards, Delaware Metal Refinery; Justice Cox, Jr., and G. A. Heberton, Justice Cox, Jr., & Co.; C. T. Holbrook; Howard Bing; D. Townsend, Philadelphia Roll & Machine Works; R. G. Taylor, R. G. Taylor & Son; W. P. Barba, Midvale Steel Co.; M. Hoagland, Jr., M. Hoagland Sons Co.; F. A. Riehle, Riehle Bros. Testing Machine Co.; C. R. Baird and Geo. C. Davis, C. R. Baird & Co.; Thos. Devlin, Louis J. McGrath, W. C. Henderson, H. Drinkhouse, Walter Devlin and W. J. Devlin, Thos. Devlin & Co.; Geo. N. Ellicott, Southwark Foundry & Machine Co.; A. G. Curtin, L. & R. Wister Co.; Wm. R. Webster; W. H. Echternach, Foundry Dept., Girard College; J. Henry Julian and A. D. Wilson, Gray's Ferry Foundry & Boiler Co.; H. A. Pedrick, Pedrick & Ayer Co.; C. H. Haeseler, C. H. Haeseler & Co.; H. W. Gadd, J. Wesley Pullman; Cyrus Borgner; A. C. Rex, A. C. Rex & Co.; Geo. R. Michener; Dr. Edward Kirk; Frank L. Keeler, Geo. R. Allen; A. E. Outerbridge, Jr., Wm. Sellers & Co., Ltd.; S. C. Hartpence, Columbia Foundry Co; H. O. Patch and W. C. Pearse, American Glutrose Works; Henry G. Morris, E. T. Adams, Juniata Furnace & Foundry Co.; John Birkinbine; Geo. Hetherington; M. B. Young; G. B. Keating, Geo P. Keating & Co.; Alfred Marshall; Geo. W. Frence and G. K. Mohr, representing J. J. Mohr; J. M. Sherrerd, Taylor Iron & Steel Co.; R. Blickenderfer; J. A. Janney, Jr., Janney & Steinmetz; R. M. Wortham, Keystone Brass Foundry; J. H. Ferguson, Brownell & Co.: W. T. Rainey, W. T. Rainey & Co.; J. W. Paxson, Howard Evans, J. K. Bougher, Wm. Fitzpatrick, J. S. Hibbs, C. Victor Emerick, Millard F. Carr, S. C. Bougher, H. J. Bougher, W. W. Wood, E. M. Taggart, J. W. Paxson & Co; Ralph J. Greider, Paul S. Reeves & Son; Wm. Hanson, Philadelphia Iron Works Co.

Pittsburg.—Isaac W. Frank, Frank-Kneeland Machine Co.; Wm. Yagle, Wm. Yagle & Co., Ltd.; John A. Logan, Jones & Laughlins; Robt. Taylor and S. Groves, Taylor, Wilson & Co.; J. S. McCormick, J. S. McCormick Co.; Geo. Mesta, Leechburg Foundry & Machine Co.; Clinton S. Buckley, Damascus Bronze Co.; J. S. Seaman, Seaman, Sleeth & Black; John C. Reed and Jas. W. Arrote, Jr., Standard Mfg. Co.; H. R. Rea, W. C. Robinson, Robinson & Rea Mfg. Co.; A. H. Blackburn, Fuel Economizer Co.; F. E. Cook and S. D. Sleeth, Westinghouse Air Brake Co.; J. A. Kelly, Scaife Foundry & Machine Co.; Chas. Bailey, Reliance Steel Casting Co.; J. W. Friend and J. F. Friend, Clinton Iron & Steel Co.; Henry H. Garrett, Westinghouse Machine Co.

Jeanesville.—T. M. Morris, V. H. Rood, Jerome Weyhenmeyer, Jeanesville Iron Works.

Port Carbon.—Robert Allison, Franklin Iron Works.

Sharpsville.—Thos. D. West, T. D. West Foundry Co.

Bristol.—T. B. Harkins, R. B. Kelly, T. B. Harkins Fdy. Co.

Scranton.—Decourcy May, Dickson Mfg. Co.

Hanover.—John Fetz, Hanover Fdy. & Mach. Co.

Dubois.—Wm. Osborn, Dubois Iron Works.

Emaus.—Geo. Ormrod, Donaldson Iron Co.

Easton.—J. F. Donaldson, Ingersoll-Sergeant Drill Co.

Chester.—J. R. Cullingworth, Robt. Wetherill Co.

Altoona.—M. F. Smearman, H. H. Stone, Pennsylvania R. R. Co.

Pencoyd.—Benj. Talbot.

Drifton.—John Rohland, Coxe Iron Mfg. Co.

Allentown —H. B. Hirsh, E. E. Weaver, Midvale Fdy. Co.

Lancaster.—John C. Hubley, J. M. Ribert, Hubley Mfg. Co. Wm. Pescock, Union Lock Hardware Mfg. Co.

Columbia —John Speara, Columbia Gray Iron Co.

White Haven. Geo. S. Emerick, Philadelphia G. S. E. Co.

Blairsville.—C. L. Tittle.

York.—Geo. P. Smyser, E. G. Smyser's Sons.

Marietta—Geo. F. Stibgen, B. F. Hiestand, Marietta Casting Co.

Reading.—Wm. C. Lockhart, Scott Foundry; Jos. B. Rooke, P. & R. Foundry; H. Heinricker, Mt. Penn Stove Works.

Hokendauqua.—Geo. J. Johnson, Thomas Iron Co.

Carbondale.—C. W. Whiting, Van Bergen & Co.

Bethlehem.—Geo. F. Pettinos, C. E. Pettinos and H. B. Taylor, Pettinos Bros.

Royersford.—J. A. Buckwalter, F. D. Buckwalter, Buckwalter Stove Co.; Y. C. Freed, Royersford Machine Co.

Thurlow.—J. M. Booth, American Steel Casting Co.

Pottstown.—James Anderson, Sotter Bros.

Erie.—Alex. Jarecki, Jarecki Mfg. Co.

Conshohocken.—Richard H. Bate, W. T. Bate & Son.

Columbia.—Howard Stauffel, Columbia Gray Iron Co.

Berwick.—W. Y. Cruikshank, Jackson & Woodin Mfg. Co.

NEW YORK.

New York City.—Curtis W. Shields, Geo. Doubleday, Ingersoll-Sergeant Drill Co.; Edward Robinson, Wells Light Mfg. Co.; Archer Brown, Rogers, Brown & Co.; Edwin C. Saumer, R. C. Berge, Clinton Iron & Steel Co.; J. F. Moore, Monitor Iron Works; W. H. Green, Jr., Vulcan Iron Works; Chas. Kirchhoff, *Iron Age;* John F. Mills, Abendroth Bros.; H. E. Floyd, James R. Floyd & Sons; W. H. Smith, Whitehead Bros.; T. P. Kelly, T. P. Kelly & Co.

Brooklyn.—Jno. W. Burr, Burr & Houston Co.

Syracuse.—E. J. Lambert, Syracuse Chilled Plow Co.

Ticonderoga.—Wm. H. Stein, Ticonderoga Machine Co.

Batavia.—Geo. Wiard, Wiard Plow Co.

Hoosick Falls.—James A. Beckitt, Walter A. Wood M. & R. Co.

Rochester.—Jno. F. Brayer, Frank N. Brayer, Co-operative Fdy. Co.; Amos Walder, Genesee Fdy. Co.

Buffalo.—T. L. Whitehead, Whitehead Bros. & Co.; Jno. C. Knoeppel, Buffalo Forge Co.; Pemberton Smith, New York Car Wheel Works; W. H. Coffin, Buffalo Foundry Supply Co.

Manlius.—W. W. Cheney, S. Cheney & Son; E. N. Scoville.

Newburgh —W. G. Kimball, S. G. Kimball's Son.

Auburn.—Thos. Jones, Capital Machine Tool Co.

Oriskany.—Geo. H. Graham, Oriskany Mall. Iron Co.

NEW JERSEY.

Elizabeth.—G. W. Vantine, Singer Mfg. Co.; E. H. Mumford, Tabor Manufacturing Co.; Wm. W. Ackerman, A. B. Moore, Saml. L. Moore & Sons; A. J. Caldwell, Henry R. Worthington; Felix Brown, Jr., A. & F. Brown; F. B. Shaffer, O'Neil Foundry Co.

Somerville.—L. M. Codington, Standard Gas Fixture Co.

Camden.—C. L. Prince, Camden Iron Works.

Woodbridge.—H. R. Valentine, M. D. Valentine & Bro.

Paterson.—Twining Campbell.

Vineland.—James L. Steward, Armstrong Iron Works.

Woodstown.—John Hanes.

Riverton.—F. C. Brooksbank, Ward & Nash.

Bordentown.—J. H. Longstreet, Riverview Iron Works.

Matteawan.—O. Miller, Westinghouse Air Brake Co.

Jersey City.—Thos. H. Williams.

DELAWARE.

Wilmington.—E. T. Betts, Betts Machine Co.; Jas. Stirling, Harlan & Hollingsworth Co.; Geo. L. Messick, Geo. A. Messick, W. W. Walker, Jno. W. Near, Pusey & Jones Co.; Henry C. Pickles, Wilmington Pipe & Fdy. Co.; W. H. Lobdell, Robert C. Tolmie, Lobdell Car Wheel Co.; James Baily, Wilmington Malleable Iron Co.

MASSACHUSETTS.

Boston.—Geo. H. Gibby, Condor Iron Foundry Co.; F. W. Gibby, Mechanics' Iron Foundry; Frank A. Magee, Magee

Furnace Co.; Arthur W. Walker and Bartlett M. Shaw, Walker & Pratt Mfg. Co.; Geo. H. Lincoln, Geo. H. Lincoln & Co.

Worcester.—Thos. R. Holman, Holyoke Machine Co.; E. B. Pierce, Wheeler Foundry Co.

Chelsea.—I. M. Winchester, Magee Furnace Co.

Lynn.—J. M. Darke, E. Edwards, General Electric Co.

Watertown.—Robert Blyth.

Charlestown.—Ed. P. Osgood, Osgood & Hart.

Cambridge.—J. B. Winlock, Barbour Stockwell Co.

Lawrence.—James F. Lanigan, Lawrence-Davis Foundry Co.

Fitchburg.—M. J. Perault.

Taunton.—F. P. Leonard, Dighton Furnace Co.

Springfield.—Wm. A. Harris, Baush & Harris Machine Co.

CONNECTICUT.

New Britain.—T. S. Bishop, Russell & Ewing Mfg. Co.; T. M. Henry, North & Judd Mfg. Co.

Bridgeport.—Chas. N. Choate, Bridgeport Deoxydized Bronze & Metal Co.

Hartford.—A. L. Carleton, Pratt & Whitney Co.

New Haven.—F. C. Mosedale, Pickands, Mather & Co.; E. E. Durant, G. F. Warner Mfg. Co.

Waterbury.—Geo. B. Scovill; Wm. E. Fulton, T. S. Lewis, Waterbury-Farrel Foundry & Machine Co.

Naugaluck.—Harris Whittemore, Naugatuck Malleable Iron Co.

Branford.—Alfred E. Hammer, V. T. Hammer, Malleable Iron Fittings Co.

Rockville.—H. B. Murlless.

RHODE ISLAND.

Providence.—Alonzo D. Amsden, Phœnix Fdy. Co.; H. A. Carpenter, Wm. H. Carpenter, A. Carpenter & Sons; James I. Bradshaw.

VERMONT.

Montpelier.—J. J. Burgen, Lane Mfg. Co.

NEW HAMPSHIRE.

Dover.—J. C. Sawyer, Somersworth Machine Co.

OHIO.

Cleveland.—Wm. McLauchlan, Pickands, Mather & Co.; A. I. Findley, *The Iron Trade Review.*

Cincinnati.—H. M. Lane, Lane & Bodley Co.; John Hill, S. Obermayer Co.

Hillsboro.—C. S. Bell, C. S. Bell Co.

Akron.—A. F. Koons, Webster, Camp & Lane Machine Co.

Springfield.—Henry C. Dimond, Warder, Bushnell & Glessner.

INDIANA.

Elwood.—Jacob Loomis, Elwood Iron Works.

ILLINOIS.

Chicago.—A. Sorge, Jr.; Wm. Ferguson, Gates Iron Works; J. H. Dalton, Walburn-Swenson Co.

MICHIGAN.

Detroit.—W. J. Keep, Michigan Stove Co.; E. A. Sumner, E. E. Mann, American Radiator Co.; John R. Russel, Russel Wheel & Fdy. Co.; John A. Penton, *Foundry*; F. A. Goodrich, F. A. Goodrich & Co.; John Smith, Jr., S. F. Hodge & Co.

WISCONSIN.

Sheboygan.—R. G. Hayssen, Herm. Hayssen, J. M. Kohler, Kohler, Hayssen & Stehn Mfg. Co.

MISSOURI.

Kansas City.—A. G. Sutherland, Kansas City Wire & Iron Works.

Hannibal.—C. A. Treat, C. A. Treat Mfg. Co.

St. Louis.—Wm. T. Koken, Koken Iron Works; John W. Harrison, Shickle, Harrison & Howard Mfg. Co.

ARIZONA.

Jerome.—Thos. Wathey, United Verde Copper Co.

MARYLAND.

Baltimore—J. P. B. Sadler, Baltimore Link Sash Weight Mfg. Co.; J. J. Lacy, J. J. Lacy & Co.; Edward P. Farrell; Wm. Gisriel, Maryland Brass & Metal Works; James A. Smyser.

VIRGINIA.

Fredericksburg.—Walter B. Tyler, Southern Foundry & Machine Works.

ALABAMA.

Anniston.—J. K. Dimmick, Anniston Pipe & Fdy. Co.

Birmingham.—Andrew Banholzer, Birmingham Machine & Fdy. Co.

KENTUCKY.

Louisville.—E. M. Drummond, Drummond Mfg. Co.

TEXAS.

Dallas.—W. S. Mosher, Mosher Foundry Co.

NORTH CAROLINA.

Raleigh.—J. H. Gill.

SOUTH CAROLINA

Charleston.—I. M. Petersen, Volk & Murdock.

CANADA.

Montreal.—Joseph Best.

Londonderry.—Chas. L. Jobb, Londonderry Iron Co.

TUESDAY AFTERNOON.

The opening session on Tuesday afternoon, May 12, at the Manufacturers' club on Walnut st., showed an attendance of about 225. President Schumann, of the Foundrymen's Association, Philadelphia, called to order and gave the greeting on behalf of the local foundrymen. His address, which gives the key to what was in the minds of many as to the outcome of the convention, was as follows:

"We have undertaken to bring together here those interested in the welfare of an industry consisting of nearly 4,000 separate establishments, with an aggregate capital invested of about $115,000,000, employing about 120,000 persons, whose annual wages amount to nearly $63,000,000. Some 2,600,000 tons of castings are produced annually, requiring some 430,000 tons of coal and coke. The total annual disbursements for material and labor amount to $114,000,000. This is the first time in the history of our country that those engaged in so great an industry have ever met to confer upon questions relating to their mutual welfare. The excessive, and to a certain extent artificial, competition now existing in all industries of this country has brought about a general movement tending toward combinations, for the purpose of combating and controlling this unrestrained and dangerous rivalry.

"Prices have taken a downward course, far below that which healthy competition would warrant. This has not only resulted in greatly deteriorating the character of the product and undermining that finer sense of honor of the individuals engaged, but is also testing to its utmost the endurance of strong establishments whose very existence is at stake, no matter how well prepared they may have been at the beginning of the struggle. We are living in an era of conflict; on the one hand, organized and concentrated capital; on the other, that which is scattered and disunited. Weak or partial organization will not avail. Unless all engaged in an industry will unite and adopt vigorous measures that may be rigidly enforced for controlling the individual members, the result will be failure.

"Our establishments are the results of our life's labor; we intended and hoped that they should endure beyond our time. To maintain these intentions and hopes has brought about this convention of foundrymen from all parts of this great country. You are here to deliberate upon questions of great importance to all, primarily that of organization. Let us be wise and above all personal matters that conflict with the aims and objects of this convention, consult for the prosperity of the foundry industry."

Mayor Warwick, of Philadelphia, then welcomed the delegates on behalf of the city, and spoke happily. He thought Philadelphia a peculiarly appropriate place in which to hold the first National convention of foundrymen inasmuch as it was in Philadelphia that the founders of the nation molded the constitution.

Theo. C. Search, of Philadelphia, president of the National Association of Manufacturers, followed with an able address which traced the wonderful development of the iron industry in the United States and commented on the value of associated effort to industrial capital. The various national organizations among manufacturers were named, not omitting the broad general organization of which the speaker is now the president. Mr. Search predicted great benefit to the foundrymen present from the association they proposed to form.

In the absence of John Birkinbine, who was expected to speak of the objects of the convention, W. H. Pfahler, of the Abram Cox Stove Co., presented the considerations that had led to the invitation from Philadelphia foundrymen for this national gathering. He emphasized the prime need—organization. Not so essential is it to have the purpose of your organization definitely formulated, as to start your organization. To further the interests of every individual foundryman by co-operation and organized effort was the end sought. He instanced the starting of the Foundrymen's Association in Philadelphia and told how it had brought together in personal acquaintance foundrymen, who, though well known in the community had met each other for the first time in the rooms of the association.

The question of organization was then broached in resolutions offered by F. A. Riehle, of Philadelphia. They recited

that the various foundrymen's associations now working in restricted territories are of much benefit to the foundry interest, but many foundrymen are not now and are not likely to be affiliated with them. It is desirable that the interests of the foundry business be furthered by a closer association among all the foundrymen of America, so that any improvements or valuable information concerning the business be as widely available as possible. In conclusion, the resolutions called for a committee on constitution and by-laws for a national organization.

The resolutions carried without discussion, but later the suggestion was made by S. Groves, of Pittsburg, that so important a matter called for a positive expression, comitting those present to the new organization. Some discussion then ensued, and finally the resolution was made the sense of the convention by a rising vote.

The committee on constitution, named by the chair, consisted of A. Sorge, Jr., Chicago; Wm. Taylor, Pittsburg; Frank A. Magee, Boston, Joseph Best, Montreal, and C. S. Bell, of Hillsboro, O. A committee on nominations was also appointed, consisting of Stanley G. Flagg, Jr., Philadelphia; H. M. Lane, Cincinnati; S. Groves, Pittsburg; James A. Beckett, Hoosick Falls, N. Y.; Wm. Ferguson, Chicago.

TUESDAY EVENING.

The evening session, owing to the fact that the Manufacturers' Club would not seat all who attended in the afternoon, was held at the Franklin Institute, as were also the sessions of Wednesday.

The first paper of the evening was by Alex. E. Outerbridge, Jr., of Wm. Sellers & Co., Ltd., on "Foundry Cranes." The speaker made use of lantern slides to illustrate his subject, and presented an exceedingly interesting and valuable discussion of the varieties of cranes, the adaptations of each, and the conditions of most efficient and economical service. The most important consideration, the speaker said, is safety; a second consideration is speed, in which the ability to reach the load in the shortest time should be combined with a steady, hoisting motion, free from jar and capable of delicate adjustments. The third consideration is economy of operation, which implies, in addition to speed, easy access to nuts, parts to be oiled, etc., ease of removing parts for repair and a proper proportion of each part to others, to make cost of maintenance the lowest.

In foundries where heavy castings are made, with long flasks, large cores and great ladles of metal, overhead traveling cranes are most advantageous. Jib cranes have advantages in establishments doing miscellaneous light work, requiring frequent service by molders. In some foundries a judicious combination of both types has advantages. A long, narrow foundry, with molds at a distance from the cupola, can better use traveling cranes than one of different shape, where the floors may be laid out in circles. Here, a jib crane, with post in the center of the floor would be best.

The value of handling facilities is illustrated in a car wheel foundry, in which 20 33-in. wheels make a day's work for a molder. In another foundry, without modern crane facilities, 10 molds are counted as a day's work. Competition has compelled a more general introduction of such machinery than formerly, and the electric motor has played a prominent part in the development of the crane.

The paper then discussed the various improvements in applying power to cranes. The electric motor has solved many problems in this connection. Requisites of a perfect crane were noted—it must be absolutely safe under all conditions; its load must never run down, but be pushed down by the hand of the operator; it must move easily, stop and start gently and hoist vertically. The delicate operations of raising, turning over and closing long flasks must be performed with absolute certainty, as also the setting of large cores, drawing of patterns, etc. The extent of the service which one modern traveling crane had been made to perform—even to the quick handling of ladles of molten metal for many molders at pouring-off time, was indicated in detail.

The other evening paper was by Curtis W. Shields, New York, of the Ingersoll Sergeant Drill Co., on "Air Compressors in the Foundry." It was a thorough-going treatment of the subject, illustrated by citations from practical foundry operations. In other columns we give the paper practically in full.

WEDNESDAY MORNING.

The seats at Franklin Institute were generally occupied at the forenoon session of Wednesday, which opened at 9:30. President Schumann introduced Charles James, M. E., of Henry Disston & Sons, Philadelphia, and W. C. Henderson, chemist, of Thos. Devlin & Co., Philadelphia, who gave a very interesting demonstration, following the reading of a paper by Mr. James, on "The Chemistry of Iron with Determinations and Their Value." With the apparatus of the laboratory, Messrs. James and Henderson went through the routine for determinations of manganese, sulphur, phosphorus, silicon and the two carbons. Samples from three brands of pig iron were employed, the three determinations for each element going on simultaneously. The irons were Bushong, of the Reading Iron Co.; Crane, of Crane Iron Co., and Thomas, of Thomas Iron Co. The results were announced as follows:

	G. C.	C. C.	Si.	Mn.	S.	P.
Bushong	3.65	.18	3.967	.736	.013	.566
Crane	3.50	.00	3.574	.368	.011	.874
Thomas	3.39	.00	2.918	.320	.011	.578

As a concluding statement, Mr. Henderson made this practical suggestion as to a mixture: By using 30 per cent of Crane, 20 per cent Bushong; .50 per cent Thomas, we would have the following as its analysis: Graphitic carbon, 3.475 per cent; combined carbon, .036 per cent; silicon, 3.323 per cent; manganese, .418; sulphur, 011; phosphorus, .714 per cent. This would make a soft, fluid iron in the casting, and easily machined. Strength would not be great, perhaps 20,000 lbs tensile.

In his paper which prefaced the analyses, Mr. James said that chemistry was not intended to supersede but only to aid and strengthen practical foundry experience. The chemical analysis of iron is but the handwriting on the wall and needs interpretation in the light of experience before it can become of use to the iron founder. Having once found by analyses the proportion of the constituents of any specially desirable iron, chemistry will enable the iron founder to reproduce these results at any time, and that, too, without slavishly following the rule-of-thumb mixes made from fancy brands of iron bought at prices far exceeding their true value. Chemical analysis is therefore related to iron founding by true economy and sound business principles and no iron founder can any longer afford to ignore it. The speaker then indicated with some detail the apparatus needed for the equipment of a foundry laboratory.

The Apprenticeship Question.

The second paper of the morning was a brief one by D. J. Matlack, of I. P. Morris Co., one of the best known of Philadelphia foundrymen, on "How to Make Good Molders." Mr. Matlack's experience had been confined to one foundry (I. P. Morris Co., at the Cramp shipyards) in which he had been successively apprentice, journeyman and foreman. The best way, he had found, to turn out good molders is to encourage the good, intelligent and industrious apprentices, and after a fair trial dismiss the incompetent and idle. He himself had erred on the side of lenience. For the good of the trade, as well as the ultimate benefit of the apprentice, fitness, industry and intelligence alone should be recognized. The rule at the speaker's foundry and at others was that a portion of the wages of the apprentice should be withheld and given him in a lump sum at the expiration of his apprenticeship. He would not record himself as definitely opposed to or in favor of the practice. He could not see, however, that it had any special bearing on the object aimed at, namely the turning out of good molders. While it might have the effect of holding a good boy to the trade, it also operated against the inclination of the employer to get rid of an incompetent boy.

The apprenticeship question is one of utmost importance and probably one of the most interesting to foundry proprietors of any brought before the convention. Doubtless many would have been glad to take part in a discussion, once it had been started but time was limited and no one was ready to take the initiative, and thus the opportunity went by.

At the noon hour the delegates gathered on the steps of the Franklin Institute and were photographed. Afterward they stepped across the street to the Builders' Exchange, where

they were the guests of the Foundrymen's Association at lunch.

WEDNESDAY AFTERNOON.

The paper by Thos. D. West, on "Utility and Advancement of Green Sand, Dry Sand and Loam Molding," printed in these columns last week, came on first at the afternoon session. Mr. West explained by means of a blackboard illustration his idea as to work that could best be bedded in.

Mr. Frank, of the Frank-Kueeland Machine Co., Pittsburg, observed that the plan explained would no doubt be well for plain surfaces, but it is in intricate work that requires to be "rolled over" that the skill of the molder comes in play. He asked Mr. West how his suggestion as to "bedding in" could be applied to engine work or rolling mill shear work. He had found that on castings from one ton to 30 tons there was considerable trouble to get proper ramming and venting.

Mr. West explained that his reference was to work with a flat surface that could be covered with a cope. Molders could form some of the castings mentioned, by means of beds at different levels. But the idea he wanted to emphasize was that there should not be hard ramming close to the face of the pattern, and venting must be well attended to by means of fine wires, so as to carry off gases quickly. In the matter of "bedding in" there is much chance for improvement. It requires more skill to bed in than to put a pattern down flat and shovel in sand and roll it over.

Mr. Schumann—Venting is one of the most important things that calls for the skill of the molder. In the case of a piece of work, say 20 feet long a slight variation in the foundation that carries the bedding board will cause a defective casting. In light work success depends upon attention to the minutest details.

In response to a question by F. B. Shaffer, of Elizabeth, N. J., as to the method to be followed where he had a number of boiler fronts to make, Mr. West replied that if they were very large he would bed them in, but if small—under 5 square feet in area, the better plan would be to roll them over.

Mr. Frence, of Philadelphia, and Mr. Wathey, of Jerome, Ariz., spoke of work they had done by bedding in. Boiler fronts 5 x 6 up to 8 x 10 were made more quickly and better by bedding in. Mr. Wathey said that he would not roll over any work of this kind if he could get good sand. Mr. Koken, of St. Louis, had found that with large boiler fronts bedding in is better; with small ones it is more advantageous to have flasks made and to roll over. He used a heavy batten 6" square and clamped on the batten direct instead of on the side.

Mr. Weyhenmeyer, of the Jeanesville Iron Works, Jeanesville, Pa., had found, in making large fire fronts that it was necessary to make the pattern as much of a frame as possible, open on top. Where there is an elbow, the corner is a very dangerous point requiring much care in preparation. He gave instructions that in the cope an elbow should never be rammed with anything but wood. If a smooth surface is desired skin dry the mold. The speaker explained, with the aid of blackboard drawing his method for the quick drying of a mold. He never allowed his men to use a trowel or a lifter on the blacking—all was put on with a camel's hair brush. The green sand molder is the molder of to-day and commands the highest wages. In response to a question by Mr. Frank as to the facing mixture for skin drying, Mr. Weyhenmeyer recommended two parts of sharp sand and one of loam for green sand work. All depends on the locality, the kind of sand available. In Pennsylvania, foundrymen were especially favored in the quality of sand available within easy reach.

"Physical Tests and Chemistry of Cast Iron."

The paper of Mr. W. J. Keep on the above subject, given in full in *The Iron Trade Review* of May 14, then came up. Mr. Keep occupied but a few minutes time, reading from his paper some key-note statements, with the conclusions arrived at.

In the discussion, Mr. West took issue with the statement about the value of results attained with 1" square test bars. He then presented from an already published paper the results of tests he had made with various kinds of iron, ranging from stove plate to gun metal, and pointed out differences between his results and those of Mr. Keep. He asked Mr. Keep how he reached the conclusion that a 1" square bar cannot give any idea of the strength of cast iron.

Mr. Beckett, of Hoosick Falls, N. Y.: The principal large castings which we make are for repairs to agricultural machiner. Some are required to be very strong. I have always made test bars and broken them to see what I could depend on. I have found that the ½" bar shed no light on the subject. Mr. Keep says: "Shrinkage varies as silicon varies. Shrinkage is a measure of silicon, and is therefore a mechanical analysis." This may be true, speaking of the same brand of iron, but it may be misleading. Shrinkage is a larger question than is commonly supposed. It depends on different elements. You can vary silicon and phosphorus and keep shrinkage uniform. Mr. Keep says again, that "silicon is more unevenly diffused than any other element," and that it "never behaves the same in different iron mixtures." For that reason I have stopped using silicon as a regulator and put my dependence in phosphorus. My observation shows that phosphorus is equally diffused, while silicon varies in different parts of a cast. Therefore, run as low in silicon and as high in phosphorus as the strength demanded will permit.

Mr. W. P. Barba, of the Midvale Steel Co., recalled a piece of steel weighing 1,000 lbs., in which the phosphorus in the upper portion was four times as great as in the lower portion. He had seen similar phosphorus variations in cast iron, but had never seen silicon vary in such a proportion.

Joseph Best, Montreal: In our work we have made ½" and 1" test bar. The iron in the ½" bar is closer than that in the 1" bar and there is more skin. We have shown strength of 450 lbs. for the ½" bar, with deflection of ¼ inch. The 1" bar showed deflection of 5-32 inch and went 2,600 lbs before it broke.

Mr. Smith, of Detroit: My test bar is 1" square and 3¾" long. I put it in a vise and use a hammer. I have found that the strength of bars cast in open sand exceeded that of covered bars. We have used 1,600 lbs. Lake Superior charcoal and 400 lbs of 3 per cent silicon iron, casting plates eight feet square and 1" thick. Bars from this iron, cast in open sand, showed 30,000 lbs. tensile.

Mr. Wm. R. Webster, of Philadelphia, presented plotted tests, which indicated departures from the relative strengths of test bars of the various sections, as indicated by Mr. Keep's chart. He instanced one ½" bar that had shown 440 lbs. in the test. The theoretical equivalent for a 4" bar would have been 80,000 lbs., but instead it showed 48,000 lbs.

Mr. Prince, of the Camden Iron Works, told of an experiment with metal from the feeding head of a large casting. The section of the feeding head was nine or 10 square inches. After the castings had been taken out, he took this piece, put it on a planer and divided it into nine pieces of 1" section. He then broke one of the corner bars, a middle bar on the side and the center bar. Roughly speaking, the corner bar was nearly 50 per cent stronger than the center bar, and the side bar was nearly intermediate between the two.

On being called upon to conclude the discussion, Mr. Keep said that he had nothing to add; that all the points raised were covered in his paper.

"Gear Molding and Gear Molding Machines."

Mr. S. Groves, of Pittsburg, presented a paper on improvements in machines for gear molding, prefacing it with some reference to the march of improvement in foundry appliances, dating from 1838 when Nasmyth brought out the geared ladle, employing the worm and wheel, and equipping it also with an arrangement for skimming the scoria from the molten iron. The advantage of molded gears over cut gears was emphasized, in that the former have the hard skin of combined carbon, which is lost in cutting. Dry sand is no longer used for cores, in gear molding, but green sand exclusively. The old-fashioned wooden cope has been abandoned because of the necessity of perfect molding; instead covered cores are used. The speaker presented a number of drawings illustrative of improvements in gear molding machines, some of them covered by his own patents.

"American Foundrymen's Association."

The report of the committee on permanent organization was then presented and discussed. The principal difference of opinion as to the constitution was on the classification of membership. The necessity for the class designated "asso-

ciate members" was questioned by some. The debate became so protracted that an adjournment was finally taken to Thursday morning, when the constitution and by-laws were adopted as described below. We summarize their provisions as follows:

Name.—American Foundrymen's Association.

Objects.—The advancement of the interests of foundry operators, or all who are concerned in the casting of any kind of metal in sand or loam molds for any purpose; to collect for the use of the association all proper information connected with the foundry business, to interchange experience, and encourage uniform customs and actions among foundrymen.

Membership.—Active members: persons, firms or corporations engaged in the production of castings of any kind, as employer, superintendent, foreman, chemist. Associate members: persons whose knowledge or services are valuable toward the objects of the association. Honorary members: persons whose knowledge or services in connection with the objects of the association have made them pre eminent. Nominations for membership to be made to the executive board, and all persons by them presented to the association may be elected by majority vote. Only active members have a right to vote or to hold office. Initiation fee shall be $5 and annual dues $12, payable in advance.

Officers.—A president, secretary, treasurer and eight vice presidents, one from the New England States, one from the Middle States, one from the Southern States, one from the Central Western States, one from the Northwest, one from the Southwest, one from the Pacific Coast and one from Canada. They shall hold office for one year and shall constitute the executive board which is empowered to fill vacancies. The duties of the Secretary, the most important officer of the association, are indicated in the following: "To keep true and accurate records of all proceedings of the association and executive board, to give proper notice of all meetings, to attend to all correspondence, notifications of elections, and do such other matters as may be directed by the executive board. And he shall attend to the proper selection and editing of all publications of this Association. He shall obtain papers on subjects of interest to the association, and shall have the power, together with the president, to amend or reject any paper which they may not deem proper. They shall prepare a set of rules to be used as a guide for the consideration and publication of papers, which rules shall be submitted to the executive board for approval." All the affairs of the association are put under the control and direction of the executive board, three of whom constitute a quorum for the transaction of business.

Meetings.—An annual meeting of the association is provided for, the date and place to be fixed three months in advance, by the executive board. Twenty five members shall constitute a quorum. The executive board shall meet at least once a year and special meetings may be called by the president at the request of any three members of the board.

THURSDAY MORNING.

The adjourned session of the convention was held at the Manufacturers' Club, Thursday morning, and it resulted in the final formulation of the constitution and by-laws and the election of officers. A proviso was added to the sections of the constitution relating to membership, by which any associate member may become an active member when recommended by the executive board and approved by a majority of the members present. In order that the association might be in a position to push its membership in its first year, an amendment was made to the section relating to election of members, providing that for the first year this be in the hands of the executive board, and that persons joining in the first six months be exempt from the payment of the $5 initiation fee.

A resolution was then passed unanimously, as submitted by S. Groves, of Pittsburg, referring to the conspicuous services of Howard Evans and John A. Penton in arousing interest in the National convention and in securing the large attendance that had made it so pronounced a success, and in testimony of the association's appreciation of their efforts, admitting them to the roll of active members.

The election of officers resulted in the adoption of the report of the committee on nominations, without change, as follows:

President—Francis Schumann, Tacony, Philadelphia, Pa.

Vice-Presidents—New England States—F. W. Gibby, Boston; Middlle States, Robert G. Taylor, Pittsburg; Southern States, Henry Clay Evans, Chattanooga; Central Western States, John M. Sweeney, Chicago; Southwestern States, W. S. Mosher, Dallas, Tex.; Pacific States, Irving Scott, San Francisco; Canada, Joseph Best, Montreal.

Secretary—John A. Penton, editor *Foundry*, Detroit.

Treasurer—Howard Evans, Philadelphia.

Resolutions of thanks to the Philadelphia foundrymen, the entertainment committee, and all who had contributed to the success of the convention and the pleasure and profit of the delegates were adopted by a rising vote. Recognition was made in the resolutions, also, of the hospitality of the reception committee of ladies, who had made the stay of the delegates' wives so pleasant with drives and river excursions and matinee parties.

A resolution was adopted instructing the executive committee to receive propositions from various cities for the next annual meeting.

With this the final business session came to an end, and some time was devoted to securing the enrollment of charter members. Probably 60 to 75 persons participated in the business of the morning. Many had gone out early in the day to various foundries scattered over the city, aiming to get through with these trips in time to go on the river excursion in the afternoon.

At 2:15 the delegates went aboard the boat provided by the courtesy of J. W. Paxson & Co., at the Arch street wharf and were taken up the river, first to the dock and warehouses of J. W. Paxson & Co., at N. Delaware ave. The whole party, numbering about 225, debarked and inspected the extensive facilities of this firm. A short distance farther up, the docks of the great Cramp works were reached, the excursion steamer running close by several frowning war vessels. These were being put in trim to meet emergencies which a time of foreign complications makes more than a possibility. With no new work on the stocks the Cramp yard presented a strange contrast to those around the Great Lakes, but repair work gives employment to about 3,500 of the 5,000 men usually kept busy. Various 15-inch armor plates about the yards, the great floating crane that lifts its enormous burdens with the same apparent ease with which the portable hoist or the jib crane of the average foundry does its work, and the powerful engines employed to drive the heavier tools of the great plant, were all inspected with interest on the way to the foundry. In this latter department gear molding in green sand was in progress and its inspection was especially interesting in view of Mr. Groves's paper of Wednesday afternoon. Loam molding, in progress in another part of the foundry followed methods familiar to nearly all the party. The sand sifting device recently brought out by Wm. Sellers & Co., Ltd., and described in these columns, was seen in operation and its excellent work was a matter of remark. The facing sand which Philadelphia foundrymen are fortunate enough to have near at hand, is an advantage which some of the visiting founders regarded with a degree of envy. The crane facilities in the Cramp foundry were noted, too, as examples of completeness, commanding perfectly every portion of the shop.

The river trip was resumed and the objective point was reached about 5:30—Washington Park, just below Gloucester on the Jersey side of the Delaware. Here a planked shad dinner was served, with the Foundrymen's Association of Philadelphia as host.

Many of the visiting foundrymen remained in Philadelphia through Friday visiting the foundries and noting methods and appliances, in which for the most part Philadelphia has an honorable distinction, in respect to advancement and completeness.

Capt. E. J. Longyear has discovered ore in his explorations in sections 28 and 29, 58-20 on the Mesabi range. Work on section 28 has shown a considerable ore body. The drill is in 190 feet of ore.

THE Champion Iron Co., Kenton, O., has recently introduced an electro-bronzing and plating department, and will be enabled hereafter to finish fine work at home.

MOLDING MACHINES AND THEIR FIELD.*

BY HARRIS TABOR.

The closing quarter of the 19th century will always stand out as the progressive age. Within its period we have seen a revolution in manufacturing processes in nearly all the branches of the iron trades—a revolution so thorough in many departments that scarcely a trace of old methods remains, and where a trace is found there is very little left to bear it company. This industrial revolution is, primarily, the result of labor-saving machinery, and labor-saving inventions are the secondary result of this revolution. In the trades which were first to adopt newer and better methods we find the greatest general progress, and we still find these trades keenly alive to every thing which will reduce cost and simplify production. No matter how small the gain, if the cost of machine can be made to give a better return than the money invested in the business, the new device is adopted. The manager of a plant for building locomotives once said to the writer, that if he could be assured any piece of machinery would reduce the labor cost of an operation in his machine shop 4 per cent. he would buy it. This is the spirit which underlies the most progressive trades in this country, and it is a similar spirit which is dominating manufacturing Germany so thoroughly that she is now England's strongest competitor in all the iron trades.

The foundry stands midway between the two iron industries which have done most to improve manufacturing conditions, and it depends on both. One feeds its cupola, and the other buys its product. I refer to the blast furnace and machine shop. In the case of the former, there have been such improvements made in smelting ores, that a furnace of 20 years ago cannot afford to run except in times of prosperity and good prices. When pig iron drops in value the old furnaces go out of blast, and they remain out until prices advance enough to warrant resumption, or they are remodeled by the engineer specially trained in combustion, fusion and chemistry.

Labor-saving machinery has made its highest record in the machine shop, which is your best customer. Take any line of manufacture you please, the locomotive, the stationary engine, the mower and reaper, and in smaller articles, the sewing machine, typewriter, watch, bicycle, gun, etc., and you marvel how such things, their multiplicity of parts, can be made and so'd so cheaply, and you marvel also at the fine workmanship which characterizes them. As you go through a modern machine shop, you wonder no longer. You there see the combined effect of the machine-builder and toolmaker automatically doing the most skillful work at minimum cost. The screw machine, in the hands of a boy, is turning out work at a cost but a little above that of raw material; the milling machine, operated by help skilled in nothing else, is making shapes with a precision that will defy the skill of the best vise hands, at a fraction of the old cost, and the turret lathe is doing work quite as wonderful. These are the machines which have done much to revolutionize machine shop practice and create new industries. And they have made the foundry business better by an increased demand for castings. Just in proportion as the cost of manufacture is reduced, the demand for articles of commerce is increased by more general use. Take, for instance, the lawn mower, a product of the foundry and machine shop; when it sold for $25, it was a luxuy in which few indulged, but with a selling price one-sixth that amount, it is a neceesity which goes with every household grass plat. It is so with nearly every article of manufacture. There are products of the foundry which would be multiplied if their cost could be lessened sufficiently.

The molding machine is destined to bear the same relation to the foundry that labor-saving machinery bears to the machine shop, and its influence will be quite as benficial. The foundry needs such help more than her machine shop neighbor, for her labor conditions are more merciless and exasperating. These conditions do more than interfere with immediate shop management; they have a bearing on supply and demand which bodes ill when business again comes to you.

The *Iron Trade Review*, a journal which discusses the various phases of the iron industry with unusual care and intelligence, illustrated one condition of your labor, in a last year's issue, so well, that I quote it. If any of you are dividing the management of your foundries with committees, it will have a significant interest:

"Careful investigations have determined that molders, on the average, work from 14 to 15 years at the trade. The union allows one apprentice for every eight molders in addition to one for the shop. In a foundry containing 80 molders, there could be, on this basis, 11 apprentices. Counting a four years' apprenticeship for each, the shop would produce an average of 2¾ new molders each year. An average life in the trade, of 14 years for the 80 molders, means that their ranks are diminished at the rate of 5 5-7 a year. The supply from the ranks of apprentices is thus less than half enough to meet the demand. Immigration supplies a portion of the deficiency. Machine molding, moreover, is lessening the demand for skilled labor in the foundry. But with all allowance made, there is still a gradual curtailment of the supply of good molders. Stove manufacturers had this question before them as the most serious problem connected with the management of their foundries. Little has been heard from it in the past two years because foundry outputs have been small and few molders have had uninterrupted employment. If the same rate of improvement noted in the past three months continues through the remainder of the year, 1896 may bring with it fresh reminders of the artificial scarcity of molding skill created by union apprenticeship regulations."

The *Review* might have added that long periods of depression, like the present, tend to decimate the molders' ranks faster than the death rate.

These are the conditions in the foundry trade which make such a great range in prices for castings. If you investigate the molders' wage rate throughout the country you will understand why you meet such low quotations in competition. For illustration we will take an order recently placed in New York. The specifications called for 20,000 castings 24″ long by 6″ wide, ¼″ thick at one end and ⅜″ thick at the other end. There were four bids, the first being $40 per ton, the second, $32, the third, made by a foundry which needed inside padding to keep up its organization, at $30, and the fourth bid of $19, made by a foundry 150 miles from New York. All the bidders except the last were in the neighborhood of New York, with a minimum wage rate for molders of $2.65 and $2.75 per day. The successful bidder had a wage rate depending on his conscience, or lack of one, and the necessities of his men. The writer knows that his highest pay for bench molders is $1 per day. With such a discrepancy in wages organized foundries cannot compete. You cannot meet such a wage rate but you can reduce the amount of skill needed in your foundry and so square yourself with your rural neighbor.

That quality, the molder's skill, on which you depend when business revives cannot be made at will. If there is a shortage you cannot buy it as you would pig iron and sand; you must train it and wait during the training process. With apprentice laws in nearly every state against the interest of the foundry, and with existing union rules limiting the number of apprentices, this is not an easy task. What is needed in the modern foundry is a capacity for expansion and contraction to suit the fickle demand of trade, without seriously interfering with an economical shop organization. The molding machine will help you to this.

There is nothing in the mechanical line simpler than a good molding machine. The machine shop favorites are complicated when compared to it. Its operation is simplicity itself, and the training necessary to turn a fair laborer into a good operator is reduced to scarcely more than ability to handle shovel and flasks. The one lesson to be learned, that of tempering sand, may be left to the foreman or his assistant until the operator is able to distinguish by touch the right temper. No matter how busy you may be or how difficult it is to find good molders, there is always a plentiful supply of muscle, and *it* is always amenable to shop rules and conditions.

The application of a good molding machine is quite as unlimited as that of any other labor saving device. With a fair amount of patience on the part of the manager, it may be made to cover a large range of work. While its operation does not call for skill beyond training in handling machine, good common sense and reasonable care must guard it. The sand must be kept at the proper temper, cores must be as carefully made as for hand molding and the pouring must be done to suit the castings. These are details easily controlled in a well managed foundry. You must dispense with molders' skill as far as possible, if you would lessen your cost and

*Read at the National Convention of Foundrymen at Philadelphia, May 12-14, 1896.

meet competition and just in proportion as this is done the management of your foundry becomes easier.

Within the past 15 years the relation of foundries to market demands has undergone changes which have escaped the notice of many of you. Old plants have been enlarged and made more efficient and many new foundries have been built. In any part of the country you please, you will find that the general capacity to produce castings has grown much faster than any natural demand for its product, in ordinary business times. This means, that with a volume of business which would have been more than satisfactory a dozen years ago, the less favored of you are still running light, in other words, like hungry competitors you are striving for business at reduced prices, if necessary. You cannot look for the hoped for difference between cost and selling price until all foundries are fairly filled with orders, and it is only at intervals that you may expect such a condition of trade.

The tendency of the past ten years has been to gradually lower prices without a corresponding reduction in cost. The burden of over production, or under consumption if you will, fall on the business management. The improved demand which marked a brief portion of last year, added to your cost sheets without giving increased va'ue to a ton of castings. It is only a boom in business, which few of you expect, that will help you at the selling end of your business. The problem before you is, with continued low values for castings, even in times of business activity, how can yon meet the new conditions. If any of you can make up for the reduced profit per ton by an increased tonnage, you are fortunate. But it was the disposition to increase tonnage for this purpose in the past that made new foundries plentiful and old foundries more prolific. If you cannot sell for more than you are now getting, or if you cannot get what you deem full value for your wares, continued existence demands a reduction in your cost wherever you can make it. With the pig iron market in much the same condition as your own, you cannot look for comfort in that direction. Coal values enter so little into the cost of your melts, that market changes in that material cannot seriously affect you. Next to pig iron, in cost, comes the labor account, and it is the one item in the cost of castings which has not been materially reduced.

Here, then, seems to be your most fruitful field for operation. It is the disposition of human nature to help the fellowman. None of you would reduce your labor to the miserable pittance paid by your meanest competitors, but you must reduce the totals of your cost sheets in some way. Labor-saving appliances seem to offer the best plan, and you naturally turn to that item which is the greatest burden—molders' skill.

A good molding machine, with plenty of nerve and determination back of it, will do much for you. As you investigate its application you will be surprised at the shapes and quantities it will mold if assisted by ingenity and skill, such as have been used in the development of the milling machine and turret lathe. Let your pattern maker and the foreman in charge of your green sand foundry or molding machines feel that they are as much concerned with the success of your machines as you are. Give them the same play of their ingenuity as they enjoy in arranging for difficult core-work, etc., now, and make them assured that the machines are as much a part of their regular equipment, and that they are as responsible for their successful and proper use as for that of any other tool or material. When this is done, you will have overcome the most serious obstacles to the introduction of molding machines.

It is a mistake to assume that molding machines are antagonistic to the molders' interest or to the interest of labor. Under the present rules limiting the number of apprentices, there will always be enough work, with average business conditions, to keep skilled molders employed; machines will take the brighter men from the laboring class and elevate their condition, at the same time making the foundry organization more efficient.

Briefly, the main advantages which follow the introduction of good molding machines, may be summed up as follows:

First, economy of production; second, uniformity in size and weight of castings; third, lessened machine shop cost when castings are to be machined or fitted; fourth, a greater product from one set of patterns in a limited time; fifth, a capacity for expanding and contracting your plant to suit trade conditions, by adding to or taking from the machines, labor which is easily obtained; sixth, and quite as important as any, the ability to run your foundry as you will, and with a view to profit.

Tropenas Steel Process.

This process, comparatively little known in this country, has made considerable progress in Europe, the works now in operation or being erected including some of considerable importance, such as Edgar Allen & Co., Sheffield, Eng.; Plichon & Co., Paris, and some eight or ten more. Russia, Belgium and Austria all being represented. It is claimed that the cost of Tropenas steel is lower than that made in any other converter and for certain purposes, such as machinery of almost every description, it can be used to great advantage.

The main features of the system are the use of a double row of tuyeres and their position being on one side of the converter only, greater depth of the converter, and the decarbonization attained under a very light pressure. The lower row of tuyeres are of large diameter and cylindrical, opening into a large blast pipe; these are called fining tuyeres. The top tuyeres are of smaller dimensions, and are called the combustion tuyeres. The main points of difference between the Tropenas process and other forms of Bessemerizing is that the compressed air does not enter the metal, but acts only on its surface, and in place of agitating the molten metal the point seems to be to keep it as quiet as possible during the operation.

One very important advantsge claimed for the process is the very large per cent of scrap iron that can be used, it apparently being converted into steel of good quality, in some instances as much as 40% of scrap is used; the final additions (1% of 14% of ferro-silicon and 1.80% of 75% ferro-manganese) are added in a molten state in either the converter or ladle. No spectroscope nor spectacles are employed in stopping the operation, the signs are so unmistakable and so well defined that any intelligent laborer can be taught to operate the converter in a week. The pressure of the blast being only 4½ pounds, any good rotary positive blower can be used instead of an air compressor. This is being done to-day in Germany. Very little ferro-silicon is used to make the charge liquid because this is accomplished by the top row of tuyeres.

Graphite in Electrical Industries

Graphite has come to be an important factor in electrical industries. A graphite crucible is used for electrical smelting, and a graphite pencil or rod is used as an electrode in electrical smelting. Graphite pulverized to an impalpable powder is used in electrolytic work by the copper smelters. Pure flake graphite is also used for lubricating cylinders and bearings of engines and dynamos, and the same material also forms the pigment for protective paints for trolley poles, electric light poles, and roofs of dynamo plants and trolley car sheds. During the last year or two the demand has very greatly increased for graphite resistance rods. Unlike German silver, it is not necessary to take into account the factor of quantity. For instance, a six-inch rod one-fourth inch in diameter may be made to have one ohm resistance or 10 ohms, or 1,000 ohms, or in fact almost any resistance that the electrician may require. The only reason for changing the dimensions of the rod would be either convenience or for radiating the heat when it is necessary to carry a current of considerable quantity at high resistance. The Joseph Dixon Crucible Co., of Jersey City, N. J., the originator of the graphite industry, and now the most extensive miner, manufacturer and importer of graphite, has paid particular attention to the requirements of electrical engineers, and is supplying the electrical industries with large quantities of material.

A LECTURE on "Modern Methods of Making Steel Forgings in America," illustrated with lantern slides, was delivered by H. F. J. Porter, Western representative of the Bethlehem Iron Co., at Armour Institute, in Chicago, May 13. This lecture was also given by Mr. Porter before the Chicago branch of the Stationary Engineers' society lately. It is exceedingly interesting, and was enjoyed very much by both audiences.

FEED-WATER HEATER AND PURIFIER.

The accompanying cuts present two views of a feed-water heater and purifier, furnished by the Kensington Engine Works, Ltd., Francis Brothers, Philadelphia, for the recently completed Philadelphia Bourse. About 18,000 square feet of space is occupied in the basement by the machinery equipment, and the chief interest centers in the power and heating plants, of which this heater, probably one of the largest in diameter ever built, is an important factor. The heater is 60″ in diameter, with shell 14′ high over all, and has exhaust steam inlets

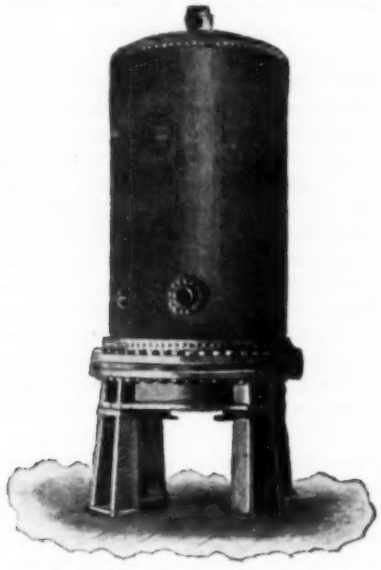

FIG. 1.—KENSINGTON HEATER—SHELL IN PLACE.

and outlets 16″ diam. It is provided with 350 square feet of heating surface, and heats the feed-water used in the boiler supply to 206° by the exhaust steam from the electric light engines and pumps, while also purifying it.

The heater is of the reservoir type, return tubular, and has a capacity of 1,250 gallons. The exhaust enters at the bottom, and passing through the tubes on one side, returns through the tubes on the opposite side, while the feed water is in the shell surrounding the tubes, thus absorbing rapidly the units of heat in the exhaust steam.

The general construction of this heater is indicated by the

FIG. 2.—60″ KENSINGTON HEATER—SHELL REMOVED.

engravings, but a few details will be of interest: There is first a cast iron base, with projecting flanges on the top, and suitable flanged nozzles on the bottom for the ingress and egress of the steam, and projections properly ribbed and braced are also provided for the reception and bolting to of the four cast iron legs, which support the heater at a suitable height from the floor.

Resting upon the top flange of the bottom casting is the tube-head, made of semi-steel, similar to that used by the Cramps, in guns, which is made convex, in order the better to withstand and resist the pressure required to force the water into the boiler, which is 125 lbs. per square inch. The tubes, which are of seamless brass, and, therefore, durable, and free from corrosion, are securely expanded into this tube-head, and thus the tubes and tube-head become practica'ly one piece.

The shell, which is of wrought steel 1½″ thick, is designed to enclose the tubes, and at the bottom end has a strong cast ring securely riveted to it, with projecting flange, corresponding in diameter to the flange of bottom casting and tube-head. The bolt-holes of all three being identical in the matter of spacing and pitch circle, one set of bolts, with proper gaskets intervening, the whole three parts of the heater are firmly bolted together.

Feed-water enters and leaves the heater by a 4½″ pipe, and all impure deposit is blown out through a 3″ mud-blow at the bottom, while the impurities which float on the surface are removed through a 2½″ surface-blow. The connections provided are shown as located on the shell in Fig. 1.

A feed-water heater of the same diameter and general construction was installed by the Kensington Engine Works, Ltd., in the power plant of the Broad street station, Philadelphia.

Iron and Steel Production in Canada.

The production of pig iron in the Dominion of Canada was first ascertained by us from the manufacturers for the year 1894, when it amounted to 44,791 gross tons. In 1895, according to reports which we have also received from Canadian pig iron manufacturers, the production amounted to 37,829 tons, a decrease, as compared with 1894, of 6,962 tons, or over 15 per cent. About one-sixth of the production of 1895 was charcoal pig iron the remainder being coke pig iron. The pig iron of Bessemer quality produced in 1895 amounted to 2,660 tons, the production being confined to one company, the Nova Scotia Steel Co., located at New Glasgow, N. S. On Dec. 31, 1895, the unsold stocks of pig iron in Canada which were in the hands of the manufacturers or their agents amounted to 17,800 tons, of which a little over two-fifths was charcoal pig iron, the remainder being coke pig iron.

On Dec. 31, 1895, there were eight completed blast furnaces in the Dominion, and of this number four were in blast and four were out of blast on the date named. On Dec. 31, 1894, there were seven completed furnaces and one building. Of the completed furnaces at that time two were in blast and five were out of blast. The furnace reported as building in 1894 was completed late in 1895, but the blast was not applied until February, 1896. The new furnace is located at Hamilton, in the Province of Ontario.

In addition to the above statistics of the production of pig iron in Canada in 1895 we have obtained from the manufacturers approximately correct figures of the production of crude steel and of iron and steel rolled into finished forms last year as follows: Production of open-hearth steel ingots, all made by the acid process, 17,000 gross tons; production of rails, 600 tons; production of structural shapes, 4,560 tons; production of cut nails by rolling mills and steel works having cut nail factories connected with their plants, 208,042 kegs of 100 pounds; production of plates and sheets, 655 tons; production of all other rolled products, excluding muck and scrap bar, 51,299 tons. Changing the cut nail production from kegs of 100 pounds to gross tons of 2,240 pounds, the total quantity of all kinds of iron and steel rolled into finished products in the Dominion of Canada in 1895, excluding muck and scrap bar, amounted to 66,402 tons.

The total number of rolling mills and steel works in Canada on Dec. 31, 1805, was 15, and in addition one rolling mill was being built, which we understand has since been completed. Of the completed plants several were idle during the whole of 1895. All the open-hearth steel ingots made in 1895 were produced by the Nova Scotia Steel Co., which also produced all the rails, which were of open-hearth steel, all the structural shapes, and all the plates and sheets. A wire nail plant is under construction at Brantford, Ontario.—[The Bulletin.

WHARTON furnace, at Port Oram, N. J., is being enlarged from 15 to 17 feet in the bosh. Frank C. Roberts & Co., of Philadelphia, are the engineers in charge of the work.

COMPRESSED AIR IN THE FOUNDRY.*

BY CURTIS W. SHIELDS.

Compressed air has long been known as an ideal medium for power transmission, but its introduction into the arts has been slow, because of the general lack of knowledge of the subject, due in a measure to the limited experience had with it. It has been looked upon as being an expensive power at best, too much of a mystery and something to be avoided rather than encountered and mastered. In many cases cheap and badly designed air compressors are put in use, and where such machines have been designed to occupy a small space or to be light in weight, compressed air is sure to cost a great deal to produce, and this has stood in the way of the general introduction of compressed air more than anything else. Only recently inventive genius has been turned toward the development of labor-saving machines which would use compressed air as a motive power.

Since compressed air is now produced economically, owing to the many recent improvements made in the design and construction of compressing machinery, the up to date plant without its air compressor in the power house is the exception. In the latest and most approved types of compressors the mechanical efficiency has been found under actual working conditions to be as high as 95 per cent, while an efficiency of 85 per cent or better is to be obtained in a small compressor suitable for any moderate foundry duty. In order to get the best results from the machines using compressed air it is of the greatest importance that the air supply shall be constant and ample. To insure this beyond peradventure the compressor must be substantially constructed on the designs shown by the severe test of experience to give the best results. The durability of an air compressor depends largely upon the design of the air parts. As the valves are the most essential feature of an air compressor, it is clear that in order to insure the proper and efficient working of the whole machine the valves must work properly and effectively at all times and under all conditions. The poppet valve is, perhaps, the most common type employed in air compressor construction, and is used for both inlet and discharge. Inlet valves of this class are very apt to cause endless trouble, particularly when they are located in the cylinder heads, as a broken stem or a loose nut permits the valve, or part of it, to drop into the cylinder. This danger may be obviated to some extent by placing a guard plate on the inside of the cylinder head. This remedy has the objection that it increases the space lost for clearance and slightly restricts the passage of air into the cylinder. In the most approved style of compressor, poppet valves are located in the ends of the cylinder instead of in the heads, and are so placed that they have a vertical instead of a horizontal lift. This arrangement assures an even wear on the valve and its seat and prevents leakage. It also prevents the piston from coming in contact with the valves, and in case of a break the valve cannot be sucked into the cylinder. This disposition of the inlet valves leaves the entire cylinder head free to be fitted with a water jacket or cooling space. It is not practicable to make poppet valves of any great diameter, hence when a large machine is built it is necessary to use a number of valves. This divides the air entering the cylinder into several small streams which pass over heated surfaces, thereby increasing the friction of the air entering the cylinder and decreasing the capacity of the compressor.

By removing the inlet valves from the cylinder head a large cooling surface, equal to about three-fourths of its area, is at once made available. This is more valuable for cooling than the cylinder jacket alone, because the air is hottest after the piston passes the center of the cylinder; hence we have the hot air pressed against the cold cylinder head, where it rapidly gives up its heat.

Many of the difficulties and disadvantages have been successfully overcome by the piston inlet valve. This device comprises a hollow tail rod passing through a stuffing box in the back cylinder head, a hollow piston into which the air is admitted through the tail rod and a ring valve of T section on each side of the hollow air piston head. These valves allow the air to pass alternately into each end of the cylinder, and are actuated by means of their own inertia, opening or closing at the moment compression ceases or begins. By means of the piston inlet device a concentrated air inlet current is secured. A suitable sleeve or conduit pipe may be made to conduct to the tail rod inlet air drawn from that source outside of the engine room most favorable to coolness, dryness and freedom from dust or other foreign matter.

Where the load on the compressor varies much it is important that an efficient regulator or governor should be provided which is thoroughly automatic in its action and requiring no attendance.

Under the ordinary conditions existing in foundries a belt driven compressor is usually more favorably considered than one driven by steam. A belt compressor fitted with a proper regulator absorbs only enough power to meet the demands of the work performed, and being run in connection with other machinery its effect on the coal consumption is not noticeable.

However, in many cases a steam driven compressor is preferable, because a high class steam actuated compressor uses steam almost if not quite as economically as a shop engine, and whatever loss there may be is more than made up for by the advantages of a steam driven compressor. With them all shafting and belting are avoided and the machine can be located in the engine room, where it can be under the care of the engineer. If installed in the foundry the dust and sand have a very appreciable effect upon the bearings and moving parts, and no matter how carefully housed, your compressor cannot be as well taken care of as though it were in the engine room.

Transmission of power by compressed air has the advantage of certainty and regularity in action, simplicity in machinery, freedom from the possibility of fatal accidents, and the assistance given to ventilation and in cooling the shop.

When we come to the question of laying out the piping for a foundry it is well to keep this simple rule in mind. The head necessary to drive the air through the pipe is as the square of the velocity, and to obtain the best results the flow of air through the pipe should not exceed 20 feet per second. If this is borne in mind air can be conveyed almost any distance with little or no loss. In the case of the famous Jeddo tunnel, at Hazleton, Pa., air at 60 pounds pressure was conveyed a distance of 10,680 feet through 5¼-inch pipe, and the gauges showed exactly the same pressure at the end of the pipe as they did at the receiver.

The receiver should be placed in any convenient place and should be of no less capacity than the rating of the compressor in cubic feet of free air per minute. A little thought and attention given to the elimination of turns and angles in the pipe mains will amply repay for the trouble. It is a great economy to lead the air mains centrally and then run small connections to points adjacent and convenient to place air is to be used. If this is done short lengths of hose pipe can be attached wherever most convenient for connection to hoists, sand sifter or other apparatus, or the air can be used for the same purposes that the bellows and brush are employed for.

The application of the air hoist to cranes may be made in an almost endless variety of ways to meet the requirements of foundries. The most common types are simple cylinder hoists, either vertical or horizontal, or in combination with a low pressure hydraulic system. In many instances direct acting hoists may be readily applied to hand power cranes already in use without in the least interfering with the gearing and at a very small expense.

There is no noise, no jar, and the load is always balanced. In foundries where an overhead traveler cannot be installed air hoists suspended from trolleys running on an overhead track answer very satisfactorily, and if hose couplings similar to those used in connection with the ordinary air brake are provided, by simply attaching the hose connection after the load is raised the hoist may be run on the overhead track to any desired part of the establishment. This is especially valuable in conveying flasks outside of the foundry to storage sheds, patterns to the pattern shop, or finished castings to the machine shop.

Few of us realize how cheap an air hoist is to operate apart from its convenience and speed in handling loads. It has been estimated by Frank Richards that at 100 pounds gauge pressure compressed air costs 5 cents per 1000 cubic feet of

* From a paper read at the National Convention of Foundrymen, Philadelphia, May 12-14.

free air. The following table gives the lifting capacities of directacting air hoists, with volume of free air per lift, and cost of air per single lift and per 100 lifts, with a maximum lift of four feet, and a minimum pressure of 90 pounds, air furnished at 5 cents per 1000 cubic feet of free air:

Diameter of cylinder.	Effective area of piston.	Maximum weight lifted.	Cu ft. free air for 4 ft. of lift.	Cost of air per lift.	Cost of air per 100 lifts.
2	3.05	274	0.74	$0.000037	$0.0037
3	6.87	618	1.67	.000084	.0084
4	12.22	1,099	2.97	.000149	.0149
5	19.09	1,718	4.64	.000232	.0232
6	27.49	2,474	6.68	.000334	.0334
7	37.42	3,367	9.09	.000455	.0455
8	48.87	4,398	11.88	.000594	.0591
9	61.85	5,566	15.03	.000752	.0752
10	76.36	6,872	18.56	.000928	.0928
11	92.39	8,315	22.46	.001123	.1123
12	109.96	9,896	26.73	.001337	.1337

Air used in combination with a low pressure hydraulic system gives the best results for heavy loads. By interposing the water between the elastic medium, air, and the load we eliminate that element of danger which otherwise would be present in handling vessels of molten metal, as in foundry practice, and also obtain a sort of elastic positiveness which is so essential and desirable. In the actual work of molding, as in lifting copes and molds, drawing patterns and moving cores, the men are enabled to do about 50 per cent. more work, and do it easier and better when equipped with hydropneumatic hoist. Included in this percentage is the saving in repairs and the danger of losing castings.

In addition to operating movable hoists, air has proven its value for conveying pig iron to the top of the cupola, and for breaking up scrap by lifting a heavy weight, which is dropped some 15 or 18 feet. This pig breaker broke three half pigs into three pieces each in one minute, and can easily break 20 tons of pig while a man is breaking up 1 ton by the old sledge method. A portable pneumatic drilling machine for boring holes to weaken stiff castings is used to advantage in connection with this breaker.

The product of a molding machine can be greatly increased if the handling of the sand in shovels is done away with. This is accomplished by an air jet, which at 60 pounds pressure will lift 100 pounds of sand per minute 20 feet high. A ¼-inch nozzle will use 90 cubic feet of free air per minute doing this duty. By elevating the sand to a bin overhead, and then conveying it in a chute or pipe directly over the molding machine much time and labor can be saved. A simple slide in the pipe forms a ready means of regulating the amount of sand served to the machine for each mold. In the portable pneumatic sand-sifter a small amount of air operates a rotary motor which drives gearing connected to the sieve. Air admitted through a ⅛-inch opening at a pressure of 70 pounds develops sufficient power to do the heaviest work.

Recent observation of a molding machine in operation at the foundry of the Ingersoll-Sergeant Drill Company, of Easton, Pa., gave the following figures: On rock drill cylinders, three helpers operating a duplex machine, can turn out 22 per day. It formerly took four molders to make this output. In other words, to do the work by hand now being turned out by the aid of the molding machine operated by compressed air would cost 100 per cent more than is being paid now. On rock drill steam chests the same machine operated by two helpers produces 66 molds per day. Formerly it required three molders to equal this number. In this case it would cost 125 per cent more to turn out same product by old method.

The economy of the sand blast for cleaning castings was quite as marked as that of the molding machine. On a flask 30x14x5 inches, made without using any facing, no difficulty was experienced in cleaning six square feet of surface per minute. A box bed-plate weighing 1,700 pounds was cleaned in one hour by the blast, while another bed-plate made from same pattern took three hours to clean by hand. With the blast the casting was cleaned so that the chipper did not have to do any cleaning, as he had to do when blast was not used. Neither brushes nor files will get around fins and risers as the blast does. A very difficult casting, with cores that are almost impossible to get out by hand, was cleaned in 45 minutes by the blast, as against two hours and 40 minutes by hand.

In this same foundry they formerly melted about five tons of iron per day, and employed 14 molders, eight core-makers, and a cleaning and chipping gang of seven. They have practically doubled their plant, and now pour 10 to 12 tons per day and employ 27 molders, 12 core-makers and a number of labor-saving devices to increase their output; but the same cleaning gang of seven men, with the addition of a sand blast, take care of the product, and the cleaning is done in a much better manner than previously. The sand blast not only effects a great saving in the actual cost of the castings, but a further saving through the removal of the oxide, which is so destructive to tools in the machine shop. This saving on tools is most apparent where the work is milled, as cutters can be run at an increased speed. The sand blast applied to to the tumbling barrel is an improvement worthy of notice. Aside from the economical features connected with the use of the sand blast, it cleans the castings far better than by hand, and where a casting has intricate steam or air passages it is of the greatest importance to be able to thoroughly clean these inaccessible parts.

Associated with the sand blast, the pneumatic chipper shows to good odvantage. These tools were formerly too delicate and complicated for foundry uses, but recent improvements have so simplified their construction that they now have only three pieces in their entire make-up, and but one of these is a moving part.

Dark foundries have found the Wells, Lucigen, or some similar light of great use where a cheap intermittent light was needed. In these lamps compressed air forces oil through a nozzle, forming a spray, which when ignited gives a flame about five inches in diameter and 30 inches long, and of about 1,000 candle-power. The air is used at a pressure of from 10 to 30 pounds, and one gallon of oil and 60 cubic feet of free air per hour suffice to operate the lamp. These hydrocarbon burners are very useful for skin-drying large molds as well as for lighting.

Breaking test bars from each cast is another use to which air has been applied.

A comparatively small air compressor of proper construction and design will furnish sufficient air for all the needs of a foundry of ordinary size. An illustration in point is a foundry running four cranes of 20, 10 eight and one ton capacity, respectively; a sand blast, two pneumatic chippers one duplex molding machine, and for blowing out and dusting molds in process of construction. In addition, the machine shop uses air for testing small engines and blowing out cylinder ports and inaccessible parts after machining, to get rid of oil and chips, and for bench dusting and copying letters in the office. Air at 60 pounds pressure for all these uses was supplied by a 14x16x18 compressor, running at 120 revolutions per minute and furnishing about 500 cubic feet of free air per minute.

THE Cleveland Engineering Co., Ltd., Cleveland, O., consisting of Cecil L. Saunders and Romaine C. Cole, is the representative of the Link Belt Machinery Co and the Union Bridge Co., for Northern Ohio. The company designs and erects the most efficient and economic devices for handling coal snd ashes for industrial plants and power stations, loading and unloading cars or vessels and conveying all materials. By means of its improved appliances it guarantees to discharge a cargo of ore from a vessel and reload with 3,500 tons of coal within 24 hours. It also installs its equipment for handling coal from cars, wagons and barges, etc., and taking the ashes from under the boilers to dump. Its telescopic ashes elevator for large buildings discharges the ashes through the hole in the sidewalk into the wagon, then revert to place. The company submits estimates on the building of steam and electrical power plants, and takes contracts for power equipment.

Concerning the suit brought by the Otto Gas Engine Works, Philadelphia, against the New Era Iron Works, Dayton, O., for alleged infringement of patent on an electric ignitor, the New Era Iron Works Co. writes that it has retained competent counsel to defend the suit, who advises that this will be done successfully. The company claims that the electric igniter on the New Era engine is radically different from that on the Otto.

THE Atlantic Iron Co., of New Castle, Pa., is now producing Bessemer iron, instead of gray forge, as heretofore.

THE TIN PLATE SITUATION.

The expectation of American tin plate manufacturers has been that an advance in prices on the other side might come as a part compensation for the higher price for steel under the operation of the billet pool. There has, indeed, been a slight advance, but as the works that have resumed in Wales have done so under a lower wage schedule, it is likely, as intimated in the following from the London *Iron and Steel Trades Journal*, that the advance will be short lived: "In tin plates, quite an active business has been passing, the oil trade being the principal buyers at quite 3d. per box over what they would pay a week ago. This is paobably accounted for by some of the merchants being caught 'short' for early delivery, and, with so few works in operation, they have found it anything but and easy task to obtain what they required. These have been the only large orders on the market, but they have had their effect on the rest of the trade, and from 3d. to 6d. per ton all round advance has been obtained this week on all home trade and export orders, which have been more numerous than formerly. The advance does not seem likely to last as a fresh batch of works are re-starting, which will again flood the market with plates and drive prices back."

We take the following from *Tin and Terne*, of Pittsburg: "What will happen should the Bessemer billet pool make another advance in the price of tin plate bars remains to be seen. It is probable, however, that besides the erection of their own basic open-hearth plants, there will be another way of escape for tin plate manufacturers from paying prices for their raw material which would prevent the competition of their product with foreign material. In another column is mentioned the fact of two important Southern manufacturers beginning the erection of basic open-hearth plants on a large scale, to manufacture the steel where the pig is produced. This steel is likely, in some markets at least, to undersell Bessemer steel, and even if it should be held at a parity with Bessemer steel, its quality is such that tin plate made from it should command somewhat higher figures than foreign tin plate made from Bessemer steel. This will be an advantage to those American tin plate makers, who, from the smallness of their plants, or lack of capital, cannot go into the steel making business themselves."

According to the latest advices there are now 36 black plate plants in operation in the U. S. or ready to operate, with 162 black plate mills completed. Most of these plants have the equipment to coat some or all of their black plate; two of them have additional black plate mills to the number of nine in process of erection, while there are three black plate plants with 11 mills in process of construction. This makes a total of 39 black plate plants with 182 mills built or building. Of the black plate mills ready to operate, between 75 and 80 per cent are turning out their full quota of black plate. There are 34 coating plants, and between 50 and 75 per cent of them are in steady operation.

WICKES BROS., of East Saginaw, Mich., manufacturers of boilers, engines and heavy mill machinery, are building for Struthers, Wells & Co., of Warren, Pa., a set of their new vertical plate bending rolls, 10′ 3″ between housings, top roll 20″ diameter, and bottom rolls 16″ diameter. They are also building a set of vertical rolls for John Mohr & Son, which are 10′ 3″ between housings, top roll 22″ diameter, and bottom rolls 17″ diameter. These rolls are designed for plates up to 1¾″ in thickness, and the tool will weigh complete 90,000 lbs.

THE Diamond Match Co., whose machine shop and foundry are at Barberton, O., will make there the machinery which will be used by the French Government in match making in accordance with the arrangement made with the Diamond Match Co. some months ago. Representatives of the Belgian and Austrian governments are now at Barberton arranging for the manufacture of match-making machinery for those countries, the right to use it being secured under a royalty contract.

MARY furnace, at Lowellville, O., and Mattie furnace, at Girard, O., will close down for repairs. The new linings will be Clearfield brick, the contract for which has just been closed by John Richardson, agent of Pittsburg.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

The Weldless Tube & Steel Co., of which ex-Gov. James E. Campbell is president, has decided to locate at Newark, O.

A. H. Barber, 229 S. Water st., Chicago, wants to buy a good second-hand iron lathe, 20 to 26 inch swing, 8 to 12 feet bed.

The Fifth Wheel Works, Mechanicsburg, Pa., are in the market for a boiler and engine, a drop hammer and other machinery.

The R. F. Beardsley Co. has been incorporated at Chicago, with a capital stock of $15,000, to manufacture bicycles, by R. F. Beardsley, W. C. Carpenter and H. H. Deloss.

The Humboldt Park Cycle Works have been incorporated at Chicago, to manufacture bicycles with a capital stock of $10,000, by E. Redendeck, Henry Englehart and M. Maret.

At the office of the supervising architect, Washington, D. C., sealed proposals will be received until 2 P. M., June 3, for all the labor and materials required to put in place complete the steel and iron work of the skylight over postoffice working room, the 7th, 8th, 9th, 10th, 11th and 12th floors and roof of tower for the U. S. Postoffice, Court House and Custom House, Milwaukee, Wis.

Specifications have been prepared for the power plant for the Union Elevated Loop R. R., of Chicago. They call for three 2,500 h. p. cross compound condensing engines and an option on a fourth engine of the same size to be delivered at a later date. A battery of about 9,000 h. p. of water tube boilers is called for, together with all the necessary pumps, heaters, filters, connections, etc., necessary for the equipment of one of these great electric generating stations. These specifications are almost identical with those for the Northwestern Elevated R. R. which were let a few weeks ago at Chicago.

The plans and specifications for the new electric light plant to be erected by the city of McKeesport, Pa., have been prepared. The city controller will immediately advertise for bids for the construction and equipment of the plant. The building is to be 35x75 feet, and will he fitted up with one non-condensing, automatic engine of 300 h. p., and another of 125 h. p. There are to be two return tubular boilers, rated at 150 h. p.; also three arc dynomos. The machinery is expected to produce 1,000 incandescent lights and 350 arc lights.

New Construction:—

The contract for the new electric light plant at Ætna, near Pittsburg, was awarded the Erie City Iron Works.

The Fifth Wheel Works, D. W. Wilcox, president, Mechanicsburg, Pa., will erect a one story iron roof building, 50x100 feet.

Plans are on foot for the erection of an open-hearth steel plant by the Reeves Iron Co., at Canal Dover, O. Cleveland capital is also interested in the project.

The United States Projectile Co., of Brooklyn, N. Y., is erecting a new building to meet the large demand for its products. It will be 100 feet wide and 450 feet long, of steel skeleton structure throughout. The steel work has been designed and will be erected by the Berlin Iron Bridge Co., of East Berlin, Conn. The trusses have a clear span of 100 feet, and the general construction is such that it will make one of the finest buildings of the kind in the country.

Additions, Enlargements, Removals, Etc.:—

The Turner Machine Co., of Danbury, Conn., expects to build an addition to its plant.

The John P. Lovell Arms Co., Boston, Mass., intends to enlarge its bicycle plant at South Portland, Me.

The American Wheelock Engine Co., Worcester, Mass., will build an addition to its plant, of wood, 100x24 feet, one story high.

The Goodell Co., Antrim, N. H., is building a 30-foot addition to its grinding room and a 20-foot addition to its tempering room.

The Kelly & Jones Co., iron and brass valve manufacturer, near Greensburg, O., has let the contract for an extensive addition and 200 additional skilled workmen will be given em-

THE COCHRANE SEPARATORS

Are sold on the following basis:

DRY STEAM. We guarantee that the Cochrane Separators (either the horz. or vert. form) will deliver steam containing less than ONE PER CENT. of untrained water, irrespective of the quantity of water in the steam entering the separator, the limit of capacity depending only upon the removal of the water accumulated in the well of the Separator.

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HARRISON SAFETY BOILER WORKS,

PHILADELPHIA, PA.

ployment. The extension will be a two-story brick, 120x40 feet.

The Weir Plow Co., of Monmouth, Ill., has decided to remove its works to East Moline, Ill. New shops will be erected at that place at once.

Clendenin Bros., of Baltimore, Md., makers of copper wire, nails, tacks, rivets, burrs, etc., is erecting an addition to its plant which will increase the floor space over 200 per cent.

The Shelby (O.) Steel Tube Co., has increased its capital stock to $500,000; it will materially increase the plant by additional buildings, benches and machinery, so that it will be enabled to turn out by October, at least 2,000,000 feet of tubing per month. One new building will be 100x110 feet, one 70x60 feet and one 130x70 feet. Contracts have been placed for a Corliss engine and new machinery for high grade tubing. This company is now employing 730 men, and with the above increase will employ in the neighborhood of 1,000.

Owing to its very largely increased business, the W. A. Jones Foundry & Machine Co., of Chicago, has been compelled to enlarge its plant, and has taken a lease of additional space immediately next to its present location, 53 to 59 S. Jefferson st. The total space now occupied by the company is 76 feet front by 150 feet deep. Four floors in all. The company has also recently purchased several new tools, and is now in a position to fill all orders. Power transmission machinery is a specialty with the company, which also does a jobbing business in iron castings and machine work.

Fires and Accidents:—

A fire at Painted Post, N. Y., destroyed the plant of the Weston Engine Co. The loss is $100,000, insurance $40,000.

The Vulcan Iron Works, San Francisco, Cal., were destroyed by fire May 10, with $100,000 loss, and $31,000 insurance. The fire communicateed to the Reliance Machine Works, damaging the building slightly and destroying considerable stock. The loss of the Reliance company is fully covered by insurance.

General Industrial Notes:—

The Manhattan Furnace Co., Chicago, manufacterers of smoke consumers, has made an assignment.

The plant of the Bellaire Steel Co., at Bellaire, O., which has been idle for some weeks, has started again.

The Phœnix Glass Co., of Monaca, Pa., has just purchased an Ohio Machine Co. 150 h. p. boiler through J. E. Schlieper, sales agent, Pittsburg.

Stuart & Co., of Pittsburg, are erecting a silica plant in the Loyal-hannah water gap below Ligonier, Pa., and will work their recently discovered fire clay vien.

The Smith Hill Machine Co., Quincy, Ill., will commence the manufacture of electric motors. C. J. Sturgeon, late of Erie, Pa., will have charge of the new department.

The Davis & Egan Machine Tool Co., of Cincinnati, O., has been awarded the contract for furnishing the United States Arsenal at Rock Island, Ill., three 16x6 tool room lathes.

The Kelly Ax Works, of Alexandria, Ind., were placed in the hands of the Union Trust Co., as receiver, on May 16. The liabilities are put at $150,000, and the assets at $200,000.

John Featherstone's Sons, proprietors of the Columbia Iron Works, of Chicago, confessed judgment in the circuit court, May 14, in favor of the Home National Bank, on notes aggregating $19,857.

UNIFORMED ATTENDANTS.

For Eastern Passengers via Pennsylvania Lines.

A uniformed parcel porter service was recently established at the Jersey City passenger station of the Pennsylvania Lines. The duties of these porters are to look after the comfort of all arriving and departing passengers over the Pennsylvania System, and to accompany them (if desired) between Cortlandt street ferry, New York City, and the American Line Pier, Sixth Avenue Elevated Railroad, and the Central Railroad of New Jersey Station; also between Desbrosses street ferry, New York City, and the Ninth Avenue Elevated Railroad.

The uniformed parcel porter service has just been extended to the Philadelphia Broad street passenger station of the Pennsylvania Lines, where porters will meet all trains and assist passengers who may desire their aid; take charge of rolling chairs when needed; meet carriages and make themselves generally useful to passengers. They will be in attendance from 6 A. M. until 12 midnight, and when accompanying passengers will carry parcels and hand baggage.

They are not permitted to charge for this service, nor to intimate in any way that a fee will be expected. Any recognition of their assistance must be in the nature of a positive gratuity, entirely optional with the person served.

The contract for the superstructure of the new steel arch bridge which is to replace the present railway suspension bridge across the Niagara River at Niagara Falls, N. Y., has been given to the Pennsylvania Steel Co. The amount is in the neighborhood of $500,000. The work must be completed within one year.

EXCURSION RATES.

To Pittsburg, Washington, St. Louis, Chicago and Elsewhere via Pennsylvania Short Lines.

Special excursion tickets will be sold via Pennsylvania Short Lines as follows:

To Pittsburg, May 24, 25 and 26, account the National Prohibition Convention; good returning until May 30; also on June 6, 7 and 8 for the North American Saengerbund Convention; good to return until June 13.

To St. Louis, June 12, 13, 14 and 15, for the Republican National Convention; good returning until June 21 inclusive.

To Chicago, July 3, 4, 5 and 6, for the National Democratic Convention; good returning until July 12.

To Washington, D. C., July 4, 5, 6 and 7, account the Christian Endeavor Convention; valid to return July 15, with provision for extension of return limit until July 31.

Special local excursions will also be run during the season

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in addition to the foregoing. Please bear in mind the concessions in fare will be granted over the Pennsylvania Short Lines, the desirable route on which all the comforts of travel may be enjoyed. Applications for information addressed to passenger and ticket agents of the Pennsylvania System will be cheerfully and promptly answered. The person to see at Cleveland is C. L. Kimball, Ass't Gen. Pass. Agt., 149 Superior cor. Bank.

AT Lansing, Mich., E. Bement & Sons, extensive manufacturers of stoves and agricultural implements, filed two trust deeds May 18, to secure claims amounting to $300,000, about equally divided between local and outside creditors. The company has ample means to pay all claims and it is said there will be no interruption to operations.

Pittsburg Saengerfest Excursions.

June 6, 7 and 8, are dates upon which excursion tickets to Pittsburg will be sold via Pennsylvania Lines for the North American Saengerfest. Return limit, June 13.

THE largest run of finished plates ever made at the universal mill of the Pottstown Iron Co., Pottstown, Pa., was made lately. The record for April was 3,185 tons, and the aggregate output of all departments of the works was 8,000 tons.

HALF rate to Cleveland and return via Cleveland Terminal & Valley R. R., account M. E. General Conference. Tickets on sale April 29, 30, May 1 and 12, 1886; good going date of sale, good returning within five days including day of sale. Tickets sold on the above dates will be available for further extension of return limit to June 2 inclusive by depositing same with joint agent at Cleveland within the five-day limit. Tickets at the same rate will also be sold on Saturdays, May 9, 16 and 23, good returning to and including the following Monday, giving Saturday, Sunday and Monday of each week at the Conference.

AT the National Tube Works, McKeesport, Pa., an electrical machine for drawing pipes from furnaces has been installed and it is expected all the furnaces will be equipped with it. Four men at each furnace are displaced by it.

Prohibition National Convention Excursions to Pittsburg.

Excursion tickets to Pittsburg, account Prohibition National Convention, will be sold via Pennsylvania Lines May 24, 25

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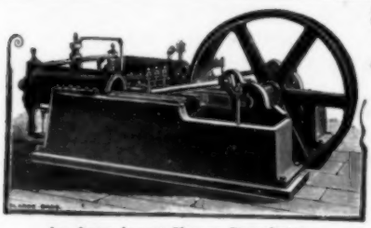
1—30x30x8 ft. Harrington Planer.
1—36x36x18 ft. Sellers Planer.
1—36x36x20 ft. N. Y. Steam Engine Co. Planer.
1—16x18″ Lathe & Morse Crank Planer.
2—15″ Hendey Shapers.
1—15″ Youngson Shaper.
1—15″ Smith and Mills Shaper.
1—10″x5′ Prentice Engine Lathe.
1 each 14″ and 15″x6′ Ames Engine Lathe.
1—16x5 ft. Bullard Engine Lathe.
1—18x8 ft. L. W. Pond Engine Lathe.
1—24x8 ft. Phillips Engine Lathe.
1—24x14 ft. Lathe & Morse Engine Lathe.
1—38x14 ft. New Haven Engine Lathe.

AND MANY OTHERS.

We have all the best makes of New Tools. Send for Second-Hand List.



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and 26; good returning until May 30. Particulars about rates and time of trains may be secured by addressing Pennsylvania Line Ticket Agents.

THE Thornburg Mfg. Co., 110 S. Jefferson st., Chicago, was closed by the Sheriff May 12, on an execution on a judgment for $8,830 in favor of the National Bank of Illinois. The company manufactures mill and elevator supplies. A statement puts liabilities at $25,000.

Democratic National Convention Excursions to Chicago.

Tickets to Chicago will be sold at reduced rates via Pennsylvania Lines July 3, 4, 5 and 6; good returning until July 12; details may be obtained by applying to Ticket Agents of Pennsylvania Lines.

THE announcement made last week that the Premier Steel Co.'s plant at Indianapolis had been leased by the American Tin Plate Co., of Elwood, Ind., and the American Wire Nail Co., of Anderson, Ind., is followed by the news that plans have been made by the National Tin Plate Co., of Anderson, Ind., to add an open-hearth steel mill to its plant.

First-Class Steamboat Service Between Detroit and Cleveland.

D. & C. floating palaces are now running daily between Detroit and Cleveland, and on May 1 commenced to run daily between Cleveland, Put-in-Bay and Toledo. If you are traveling between the above points, take advantage of a water trip and save money. Spend your vacation on the Great Lakes. Send for illustrated pamphlet. Address A. A. Schantz, G. P. A., Detroit, Mich.

IN a week's shutdown at the Benwood plant of the Wheeling Steel & Iron Co., the puddling furnaces have been repaired, and some improvements made in the skelp department.

Christian Endeavor Washington Excursions.

Low rate tickets to Washington account Christian Endeavor Convention will be sold via Pennsylvania Short Lines July 4,

5, 6 and 7; good to return until July 15, with privilege to extend limit until July 31. See Pennsylvania Line Ticket Agents for details.

THE Lane & Bodley Co, Cincinnati, continues to have a good run of orders for its Columbian Corliss engines, which have found favor wherever used. The company is quite busy in its foundry department and has orders for several car loads of pulley hangers and other appliances.

St. Louis Excursions for Republican National Convention

June 12, 13, 14 and 15, via Pennsylvania Lines; good returning until June 21. Rates and time of trains may be obtained of Pennsylvania Line Ticket Agents.

AN eight-inch Harveyized nickel-steel reforged plate was tested at the Indian Head proving grounds, May 13. The plate represents a lot of 600 tons or armor, constructed by the Carnegies, for the Russian government, and the test was satisfactory.

INSTRUCTIONS have been given to equip 5,000 Lake Erie & Western freight cars with automatic couplers and air brakes, and its 60 freight engines will also be equipped with air brakes. This will be the chief business of the company's shops for some time.

Steam Yachts and Marine Machinery,

Also Towing Launches built by Marine Iron Works, Clybourn and Southport avenues, Chicago. Free illustrated catalogue. Write them for it.—*Adv.*

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CLEVELAND, O.

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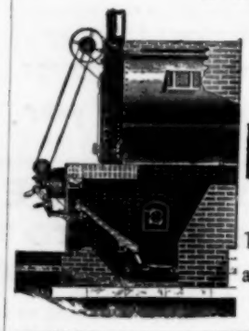

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SOLE MANUFACTURERS OF THE
Brightman Mechanical Stoker
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THE MOST ECONOMICAL IN FUEL
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WORKS:
Farrel Foundry & Machine Co. and Pacific Iron Works.
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"FARREL'S" (Blake Pattern)
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AND
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CLINTON AND HECTOR
Inspected Foundry Pig Irons
For Softness, Strength, Fluidity, Durability,
OVER OTHERS.
"Consistency is a Jewel," but so is Uniformity.
Iron to work the same to-day as yesterday.

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Engines and Steam Plant,
ALSO
CAST STEEL CUT GEARS
Much Superior to Cast Iron.
MAKERS OF
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YOUNGSTOWN, OHIO
MFR'S OF **POLISHED SHAFTING**

Well, Ridgway, Now What?

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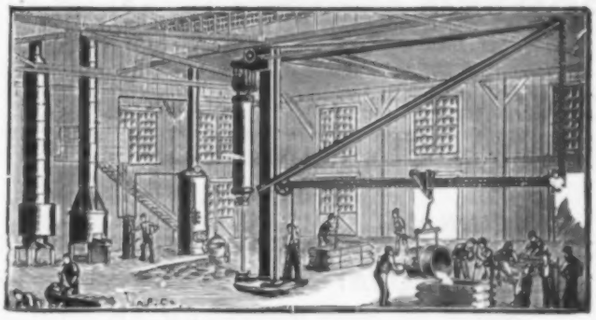
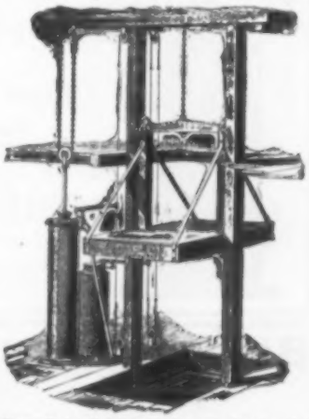
The National Supply Co., of Toledo, O.



5-ton Steam-Hydraulic Crane in a Foundry.

They wanted to equip their foundry. Had an idea that electric travelers were what they needed. But they went up to Detroit and saw the Ridgway Crane at work in the new foundry of the Leland & Faulconer Co. and of course that settled them at once and the Ridgway Crane was adopted. It is always thus. The only reason you are not in the goodly company of Ridgway Crane users is because you don't know about it. If you just took the trouble to investigate a little bit you wouldn't be without it any longer than you could raise the money to buy it. The Ridgway Crane in a foundry makes the money. That's the thing. With it two men do as much work as three men with other cranes. This crane won't go galloping up and down the shop. It will stay right there and help the molders get out lots of work and have it good when done. It will deliver anything on a truck which a dollar-a-day man can push away, and then give its attention to two and three dollar men. Men don't have to stand around and wait till crane gets loose at other end of the shop. A molder away down on the floor don't have to yell at a fellow away up there in a cage for jerking his mold to pieces, and all that kind of thing. No "sticks," "tears," "drops" and "scabs" where Ridgway Cranes are used. You will never know what a perfect Foundry Crane is until you work a Ridgway Crane.



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For special work, requiring extremely low sulphur and phosphorus, we are prepared to guarantee a maximum of

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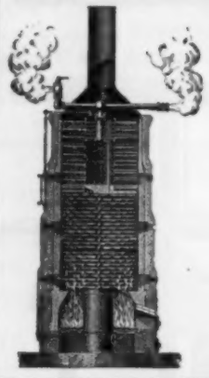

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For a long time,

We have learned that **HEATING SURFACE** does not always mean **HORSE POWER;**

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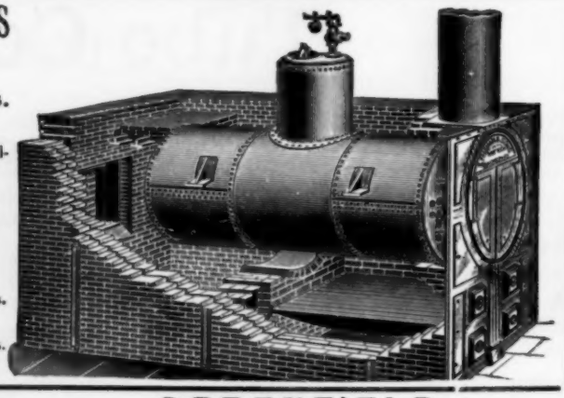

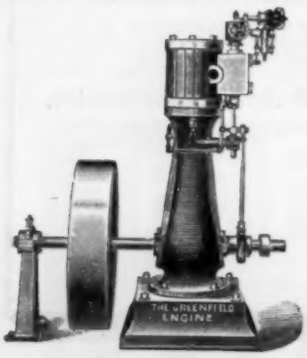

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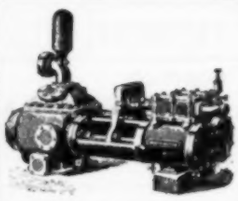

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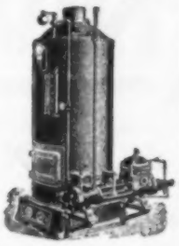

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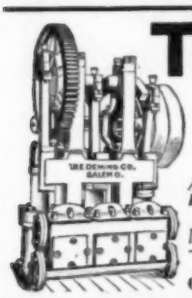

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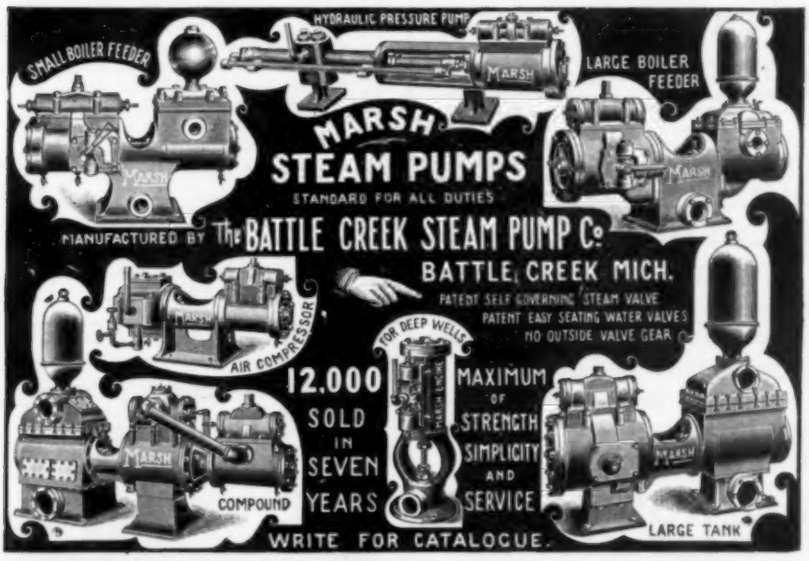

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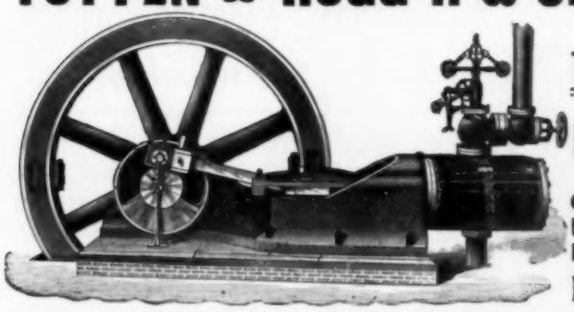

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Chilled and Sand Rolls and Rolling Mill Machinery.

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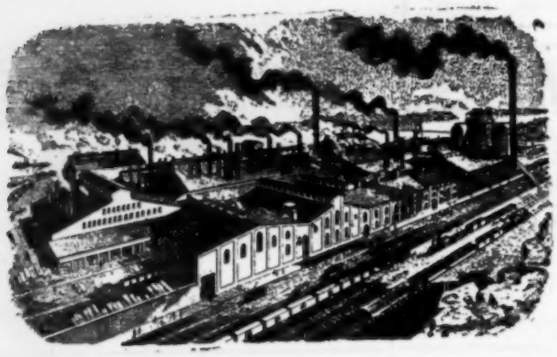

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ROLL and SHEAR PLATES to DIMENSIONS. Write Us.

Don't Waste Money in Your Pattern Shop.
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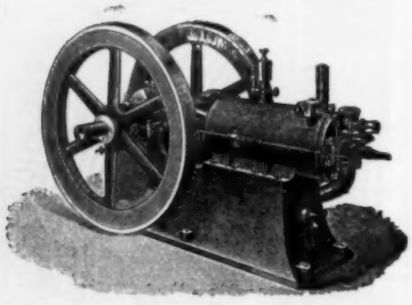

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It will control Feed Water Pump Automatically.
It will save largely in Fuel Consumption.
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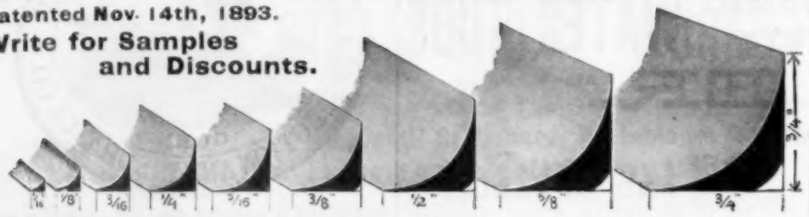

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In the **Monarch** the necessity of repair has been reduced to a minimum. Its strength, lightness, and beauty make it a marvel of modern mechanical skill.

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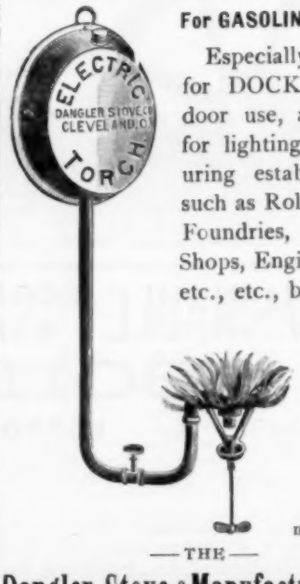

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Don't continue in the old rut and rust out.
Be progressive—keep in touch with the times.

Move to Chicago Heights

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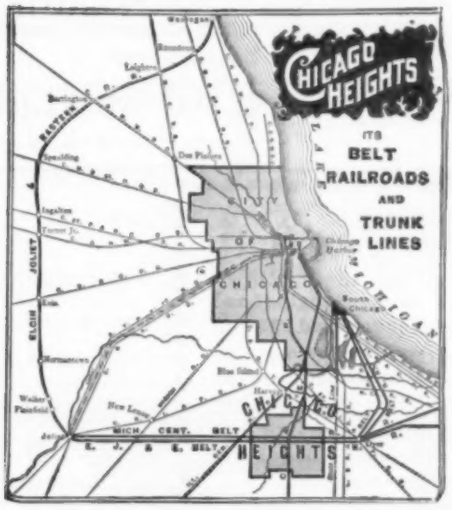

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A test of three tubular boilers of Cleveland Water Works, made Oct. 4th, 1895, by a waterworks engineer, shows an evaporation of over ten pounds of water to one pound of nut coal, and during the test the stack was entirely free from smoke.

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The Best Flux known for Welding

IRON TO IRON, Manufactured in

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Welding Compound
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Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
alem and Pittsburg	* 8:00 am	* 8:30 pm
ittsburgh, Bellaire and East	† 3:30 pm	† 6:25 pm
hiladelphia and New York	* 1:40 pm	*11:25 a m
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:30 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:10 am	* 5:45 pm
Akron and Columbus	* 8:10 am	* 5:45 pm
Akron and Columbus	† 1:40 pm	†12:10 pm
Columbus and Cincinnati	* 8:00 pm	* 7:30 am

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Valley Jctn. & Way Stations	*6:30 P M	*7:10 A M
Akron, Canton & Valley	*10:10 A M	*3:15 P M
Akron, Canton & Chicago	*8:10 A M	*6:30 P M
Akron, Canton & Wooster, Defiance, Garrett, Marietta, Wheeling, Washington, D. C., and Baltimore	†2:55 P M	†11:00 A M

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Did it ever strike you that a

Good Welding Compound

is better and cheaper

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Arm and Hammer (Brand

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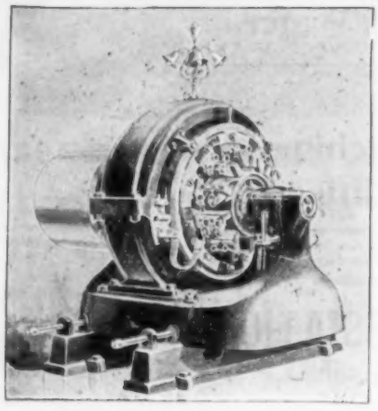

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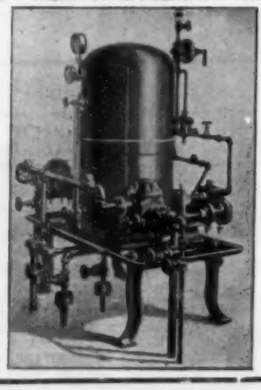

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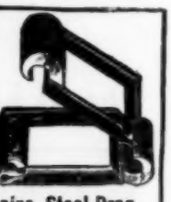

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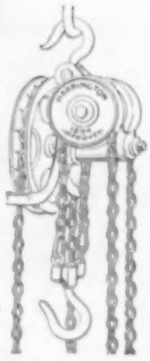

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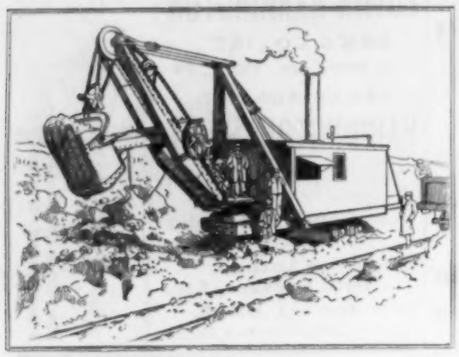

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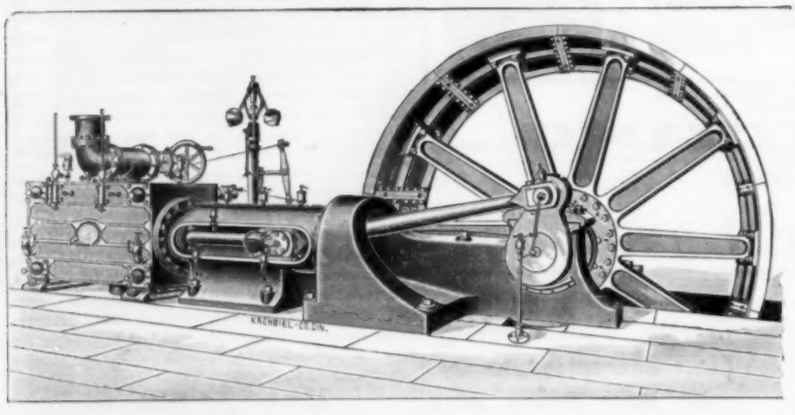

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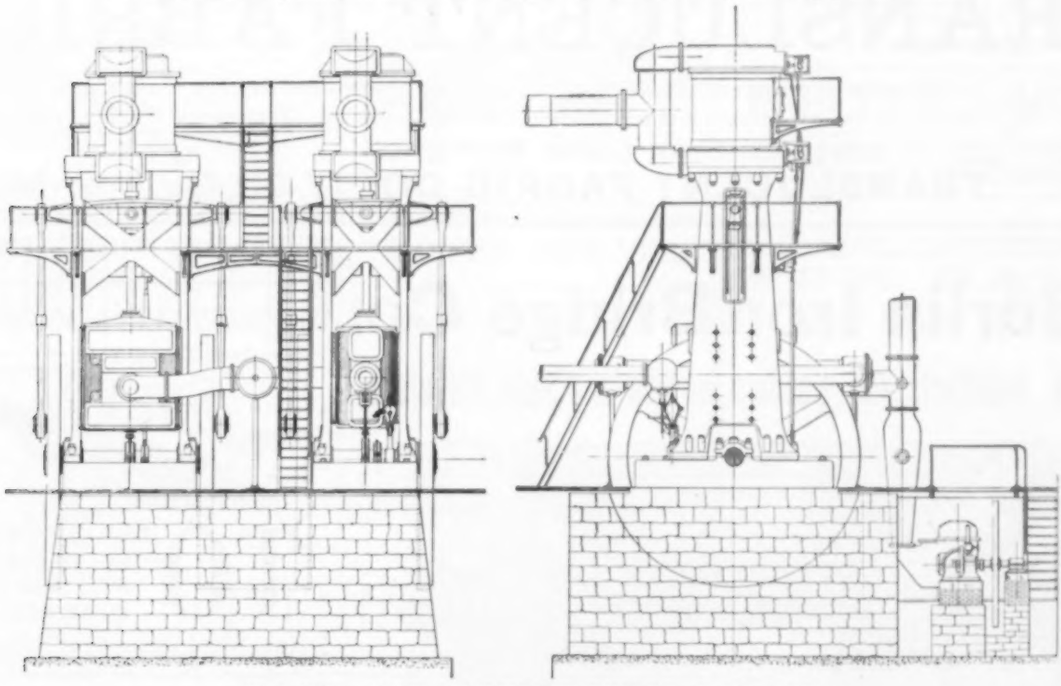

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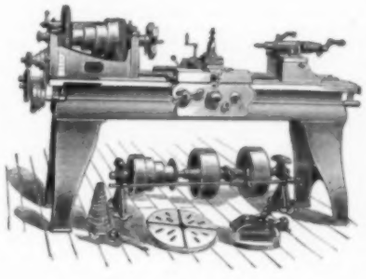

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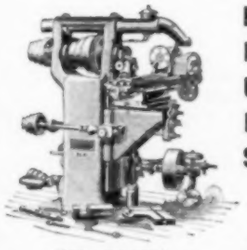

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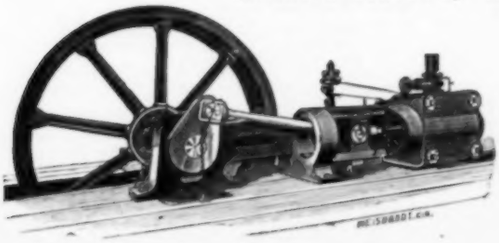

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Wm. Tod & Co., Youngstown, O.
Totten & Hogg I. & S. F'dry Co., Pittsburg, Pa

Chucks—
Skinner Chuck Co., New Britain, Conn.

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Forster, Waterbury & Co., Chicago, Ill.
C. K. Pittman, Chicago, Ill.
W. H. Coffman Coke Co., Bluefield, W. Va.

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Semet-Solvay Co., Syracuse, N. Y.

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Vulcan Iron Works Co., Toledo, O.

Dies—
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Lodge & Shipley Machine Tool Co., Cincinnati.
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Drop Presses—
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Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.

Dredges—
Vulcan Iron Works Co., Toledo, O.
American Blower Co., Detroit, Mich.

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Roberts Steel Chain Belting Co., Pittsburg.

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Sterling Emery Wheel Mfg. Co., Tiffin, O.

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The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
Acme Mineral Nugget Co.	21
Adt & Son, John	33
†Addyston Pipe & Steel Co.	—
Ætna-Standard Iron & Steel Co.	38
Aitchison, Rob't Perforated Metal Co.	37
Allis & Co., Edward P.	36
American Blower Co.	22
American Fire Brick & Clay Co.	20
American Smokeless Furnace Co.	20
Armstrong Bros. Tool Co.	1
Atlanta Steel & Tin Plate Co.	2
Atwood & M'Caffrey	21
Bacon, Earle C.	22
Baird Machinery Co.	21
Battle Creek Steam Pump Co.	25
Berlin Iron Bridge Co.	32
Besly & Co., C. H.	42
Bethlehem Iron Co.	41
*Berger Mfg. Co.	29
*Bertsch & Co.	29
Bickford, H.	42
Bourne-Fuller Co.	24
Brightman Furnace Co.	22
Brown, Edward	41
Brown Hoisting & Conveying Machine Co.	27
Bucyrus Steam Shovel & Dredge Co.	30
Buffalo Forge Co.	1
Cady Mfg. Co.	37
Cambria Iron Co.	39
Canton Leather Fillet Co.	26
Central Iron & Steel Co.	41
Chicago Heights Land Ass'n.	27
†Chicago & Northwestern Ry.	—
Channon & Co., H.	42
Church, Isaac	41
Cincinnati Corrugating Co.	2
Claflen Mfg. Co.	41
Clearfield Fire Brick Co.	41
Cleveland & Buffalo Transit Co.	24
Cleveland City Forge & Iron Co.	1
Cleveland Electrotype Co.	32
*Cleveland Galvanizing Works	29
Cleveland Rolling Mill Co.	41
Clinton & Hector	22
*Clonbrock Steam Boiler Co.	29
Coffman Coke Co., W. H.	38
*C. M. & St. P. Ry.	29
Cole, J. Wendell	42
Collins & Co., H. E.	1
Craig Ridgway & Son	23
Dangler Stove & Mfg. Co.	26
*Davis & Egar Machine Co.	33
Deming Co.	25
Detroit & Cleveland Steam Navigation Co.	32
*Diamond Machine Co.	—
Dickman & MacKenzie	2
Dixon, Jos. Crucible Co.	37
Dover Fire Brick Co.	41
East Chicago Foundry Co.	20
Emmerton, F. A.	2
Empire Boiler Cleaning Co.	30
Enterprise Boiler Co.	42
Finished Steel Co.	22
*Fix Sons	29
Fleharty, J. H. & Co.	32
Forster, Waterbury & Co.	1
Fraser & Chalmers	22
*Freeman & Sons, S.	24
*Fulton Steam Boiler Wks. & Fdy. Co.	24
General Electric Co.	32
Garden City Foundry Co.	38
†Garden City Sand Co.	—
Gerlach, Peter & Co.	24
Gobeille Pattern Co.	26
Goetze, Otto	3-20
*Greenfield, W. G. & G.	24
*Haeseler & Co.	29
Hamilton Foundry & Machine Co.	1
Harrington & King Perforating Co.	40
Harrington, Son & Co., Edwin	29
Harrison Safety Boiler Works	19
Hartford Steam Boiler Insp. & Ins. Co.	25
Hazelton Boiler Co.	24
Hooven, Owens & Rentschler Co.	30
Hubbell, Harvey	42
Hunt & Co., Robert W.	2
Illinois Central R. R.	40
Illinois Screw Co.	1
Indiana Bicycle Co.	39
International Correspondence School	21
Iron Clad Paint Co.	37
Jeffrey Mfg. Co.	28
Jenkins Bros.	38
Jessop & Sons, Ltd., Wm.	33
Jones Foundry Co., W. A.	1
Johnson Co., The	38
Junction Iron & Steel Co.	2
Kellogg Weldless Tube Co.	23
Kurtz & Buhrer Foundry Co.	1
†Kelly & Co.	—
Lambert Gas & Gasoline Engine Co.	42
Lane & Bodley	33
Link Belt Machinery Co.	25
Lloyd Booth Co.	40
*Lodge & Shipley Machine Tool Co.	42
Marine Iron Works	22
Marion Steam Shovel Co.	41
McDowell Steel Co.	41
McEwen Mfg. Co.	28
McNaull & Co.	25
Michigan Mining School	29
Miller Gas Engine Co.	21
Mitchill, Cornelius S.	27
Monarch Cycle Mfg. Co.	26
Morton Tin Plate Co.	24
Moyes, L. M.	39
Moore Mfg. & Foundry Co.	1
*Nanz & Co.	—
National Engraving Co.	26
Newell Bros.	1
Newhall & Co.	28
Norman Co., J. J.	26
North American Metaline Co.	42
Oglebay, Norton & Co.	24
Ohio Sand Co.	42
Otto Gas Engine Co.	37
Pittman, C. K.	2
Pittsburg Steel & Iron Mfg. Co.	26
Pollock, Wm. B. & Co.	2
Playford Stoker Co.	27
Pope, E. C.	24
Prentiss Tool & Supply Co.	33
Q. & C. Co	42
Rand Drill Co.	2
Rippel Mfg. Co.	1
Reese, Hammond & Co.	42
Roberts Steel Chain Belting Co.	38
Rockwell & Co, W. S.	28
Salem Wire Nail Co.	40
Semet-Solvay Co.	28
‖Sharon Fire Brick Works	1
Sharpless & Winchell	42
†Shaw Electric Crane Co.	—
Shiffler Bridge Co.	39
Skinner Chuck Co.	42
Southwark Foundry & Machine Co.	24-31
Springfield Machine Tool Co.	42
Standard Paint Co.	41
Star Dynamo Co.	37
Starrett Co.	1
Sterling Emery Wheel Mfg. Co.	40
Stirling Co.	25
Stevens, F. B.	42
Stilwell-Bierce & Smith-Vaile Co.	2
Stowe, Fuller & Co.	20
Stuart Fire Brick Co.	39
Sturtevant Co., B. F.	2
Sykes Iron Roofing Co.	28
Taylor & Boggis Foundry Co.	1
Textor, O.	2
Tod, Wm. & Co.	10
Toledo Machine & Tool Co.	41
Totten & Hogg I. & S. F'dry Co.	25
Trethewey & Co.	26
Translucent Fabric Co.	32
Union Mining Co.	20
Universal Telephone Co.	1
Upson Nut Co.	1-22
Valley Iron Works	26
*Vulcan Iron Works, Toledo	30
Wickes Bros.	2
†Ward & Nash	—
Westinghouse Electric & Mfg. Co.	35
*Williams Mfg. Co.	25
Westmoreland Fire Brick Co.	37
Worthington, Henry R.	25
Wright Co.	33
Young, J. D.	22

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	$4.50@4.75
No. 1 Bessemer hematite	4.00@4.25
Hematites No. 1 non-Bessemer	2.25@2.75
No 1. Specular, non-Bessemer	2.75@3.25

PIG IRON.

CLEVELAND (f. o. b. cars):

Bessemer	$12 75@13 00
No. 1 Strong Foundry	12 50@13 00
No. 2 Strong Foundry	12 00@12 50
No. 1 Gray Forge, red short	11 00@11 25
No. 2 Gray Forge, neutral	10 75
No. 1 American Scotch	13 00
No. 2 American Scotch	12 50
Lake Superior Charcoal	13 50@14 00

PITTSBURG:

No. 1 Foundry	$12 50@12 75
No. 2 Foundry	12 00@12 25
Gray Forge	10 75@11 00
White and Mottled	10 25
Warm Blast Charcoal	15 00@16 00
Cold Blast Charcoal	22 00
Bessemer	13 65@13 00

CHICAGO (reported by our representative:)

Lake Superior Charcoal	$13 50@14 00
Local Coke Foundry No. 1	12 25@12 50
Local Coke Foundry No. 2	11 75@12 00
Local Coke Foundry No. 3	11 00@11 50
Local Scotch Foundry No. 1	12 25@12 50
Local Scotch Foundry No. 2	11 75@12 00
Local Scotch Foundry No. 3	11 00@11 50
Southern Coke No. 1	12 10@12 35
Southern Coke No. 2	11 60@11 85
Southern Coke No. 3	11 10@11 60
Southern No. 1 Soft	11 60@11 85
Southern No. 2 Soft	11 35@11 50
Southern Silveries No. 1	11 85@12 35
Southern Silveries No. 2	11 60@11 85
Jackson Co. Silveries	14 50@16 00
Ohio Silveries No. 1	15 00@15 50
Ohio Silveries No. 2	14 50@15 00
Ohio Strong Softeners	15 00@15 50
Alabama Car Wheel	16 85@17 35
Malleable Bessemer	13 25@13 50
Coke Bessemer	13 00@14 00

CINCINNATI (reported by Rogers, Brown & Co.)

Southern Coke No. 1, Foundry	$11 00
Southern Coke No. 2 and No. 1 Soft	10 50
Hanging Rock Coke, No 1	12 50@13 50
Hanging Rock Charcoal No. 1, Fdy	16 00@17 00
Tennessee Charcoal No 1	13 00@14 00
Jackson County Silvery No 1	14 00@14 50
Southern Coke, Gray Forge	9 50
" " Mottled	9 50
Standard Alabama Car Wheel	15 00@16 00
Tennessee " "	14 00@15 00
Lake Superior " "	15 25@15 50

BUFFALO:

No. 1 Foundry Strong Coke Iron Lake Superior Ore	$13 00@13 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	12 50@12 75
Ohio Strong Softener No. 1	13 00@13 50
Jackson Co. Silvery No. 1	15 25@15 50
Lake Superior Charcoal	13 50@14 00
Southern Soft No. 1	12 15
Hanging Rock Charcoal	17 00

ST. LOUIS (reported by Rogers, Brown & Meacham):

Southern Coke No 1	$11 50
Southern Coke No. 2	11 00
Southern Coke No. 3	10 50
Southern Gray Forge	10 00
Southern Charcoal No. 1	15 00
Missouri Charcoal No. 1	14 00@15 00
Ohio Softeners	16 00
Lake Superior Car Wheel	15 00
Southern Car Wheel	16 25

OLD RAILS AND SCRAP METAL.

	GROSS TONS
Old iron rails	$16 50
Old steel rails	12 50
Old car wheels	13 00
	NET TONS
No. 1 R. R. wrought scrap	$12 75
Mill scrap	10 00
No. 1 Machine cast scrap	10 00
Iron axles	17 50
Axle turnings	9 00
Wrought turnings (free from cast)	8 00
Cast borings	7 00
Uncut wrought iron boilers	4 00
Steel boiler plates	10 00
Grate bars	6 75
Pipes and flues (clean)	10 00
Tank iron	10 00
Hoop and band iron	7 00
Sheet iron	6 50
Wrought drillings	7 50
Malleable iron	10 00

STRUCTURAL MATERIAL.

Beams and Channels (Cleveland mill)	1.64c
Angles	1.34c@1.39c
Tees	1.49c
Universal Plates	1.40c
Sheared Plates	1.45c

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 30
4½ to 6 by ⅜ to 1 inch	1 35
1½ to 6 by 1¼ to 2 inch	1 35
1¼ & 1½ by ⅜ to ¼ inch	1 20
1 & 1¼ by ⅜ to ¼ inch	1 20
⅛, ¼, ⅜, by ⅜ to ½ inch	1 20

Frank P. Cady, Pres. and Supt.
Geo. H. Bowler, Sec'y and Treas.
THE CADY MFG. CO.
18, 20 and 22 Johnson St., CLEVELAND, O.

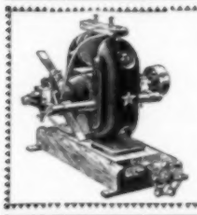
SEND FOR OUR NEW CATALOGUE OF
Power Presses, Drop Hammers,
Punches and Shears, Wire
Working and Special Machinery.

PERFORATED METALS
OF ALL KINDS FOR
MILLING MINING AND
AGRICULTURAL MACHINERY,
PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.
LARGE AND VARIED ASSORTMENT OF SIZES. CORRESPONDENCE SOLICITED.
THE ROBERT AITCHISON.
PERFORATED METAL CO.,
OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.

A. H. LEITCH, PREST. JOHN C. LEITCH, SEC. AND TREAS

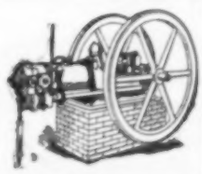
WESTMORELAND FIRE BRICK CO.
MANUFACTURERS OF
HIGH GRADE
FIRE BRICKS.
PITTSBURG, PA.
Works and Mines, Westmoreland, Pa.

PL
DIXON'S PERFECT LUBRICATING GRAPHITE.
The most Marvelous Lubricant Known.
Used Dry, or Mixed with Water, Oil or Grease
NOT AFFECTED BY HEAT, COLD, STEAM OR ACIDS.
An Interesting and Instructive Pamphlet will be sent Free of Charge.
JOS. DIXON CRUCIBLE CO. Jersey City, N. J.



SMALL DYNAMOS
For Incandescent Lighting,
In Factories, Mills, etc., at a Reasonable Price.
If you have power put in your own lighting plant. Write for our Catalogue.
STAR DYNAMO CO., Jefferson City, Mo.

POWER From GAS OR GASOLINE.
No Steam, Coal, Ash, Gauges, Engineer nor Danger.
From 1 to 250 horse-power. } Can be Used in City or Country.
THE OTTO GAS ENGINE WORKS, Inc.
33d and Walnut Sts., PHILADELPHIA, PA.
S. M. York, 42 S. Water St., Cleveland Agent. Over 45,000 Sold.



IRON CLAD PAINT CO.
Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.
CLEVELAND OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE
Iron Clad Paint Co.
And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.
IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.
FURNISHED both Dry and Ground in Oil
USED BY NEARLY ALL THE RAILROADS.

Round and Square.

1 to 1⅞ inch	1 10
2 to 2½ inch	1 30
2¾ to 3¾ inch	1 25
3⅞ to 4 inch	1 60
4¼ to 4½ inch	2 20
4¾ to 5 inch	2 40

Oval.

⅜ to 1¼ inch	1 30
⅝ to ¾ inch	1 30
⅞	1 50
1	1 70

Half Oval and Half Round.

1⅛ to 3 inch	1 65
⅜ to 1⅛ inch	1 45
⅜ to ¾ inch	1 70
⅞	1 85
1	2 90

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 20
1 to 1¾ by ¼ and 5-16 inch	1 25
¼ to ⅜ by ¼ and 5-16 inch	1 35
⅛ to ⅜ by ¼ and 5-16 inch	1 60

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	1 35
1 7-16 to 2, No. 17, 18 and 19	1 40
1 7-16 to 2, No. 20	1 50
1 7-16 to 2, No. 21	1 60
1 7-16 to 2, No. 22	1 70
1⅛ to 1⅜, No. 13, 14 and 15	1 40
1⅛ to 1⅜, No. 16, 17 and 18	1 45
1⅛ to 1⅜, No 19 and 20	1 50
1⅛ to 1⅜, No. 21	1 60
1⅛ to 1⅜, No. 22	1 70
15-16 and 1 inch, No. 13, 14 and 15	1 35
15-16 and 1 inch, No. 16, 17 and 18	1 50
15-16 and 1 inch, No. 19 and 20	1 60
15-16 and 1 inch, No. 21	1 70
15-16 and 1 inch, No. 22	1 80
⅞, No. 13, 14 and 15	1 60
⅞, No. 16, 17 and 18	1 70
⅞, No. 19 and 20	1 80
⅞, No. 21	1 90
⅞, No. 22	2 00
13-16, No. 13, 14 and 15	1 70
13-16, No. 16, 17 and 18	1 80
13-16, No. 19 and 20	1 90
13-16, No. 21	2 00
13-16, No. 22	2 10
¾, No. 13, 14 and 15	1 80
¾, No. 16, 17 and 18	1 95
¾, No. 19 and 20	2 05
¾, No. 21	2 15
¾, No. 22	2 25
11-16, No. 13, 14 and 15	2 05
11-16, No. 16, 17 and 18	2 10
11-16, No. 19 and 20	2 20
11-16, No. 21	2 30
11-16, No. 22	2 40
11-16, No. 23	2 50
⅝, No. 13, and 15	2 10
⅝, No. 16, 17 and 18	2 20
⅝, No. 19 and 20	2 30
⅝, No. 21	2 40
⅝, No. 22	2 50
⅝, No. 23	2 60
9-16, No. 13, 14 and 15	2 30
9-16, No. 16, 17 and 18	2 40
9-16, No. and 20	3 50
9-16, No. and	1 60
9-16, No. 221	2 70
9-16, No. 22	1 80
7-16 a d ½ inch, No. 13, 14 and 15	3 50
7-16 and ½ inch, No. 16, 17 and 18	2 60
7-16 and ½ inch, No. 19 and 20	2 70
7-16 and ½ inch, No. 21	2 80
7-16 and ½ inch, No. 22	2 90
7-16 and ½ inch, No. 23	3 00
½, No. 13, 14 and 15	3 00
½, No. 16, 17 and 18	3 10
½, No. 19 and 20	3 20
½, No. 21	4 50
½, No. 22	3 60
½, No. 23	3 75

Light Band.

1½ to 6 by ⅛ to 3-16 inch	1 60
1⅛ to 6 by Nos. 11 and 12	1 65
1 to 1¾ by ⅛ to 3-16 inch	1 65
1 to 1¾ by Nos. 11 and 12	1
⅞ and 13-16 by ⅛ to 3-16 inch	1
⅞ and 13-16 by Nos. 11 and 12	1 75
¾ and 11-16 by ⅛ to 3-16 inch	1 90
¾ and 11-16 by Nos. 11 and 12	1 95
⅝ and 9-16 by ⅛ to 3-16 inch	2 05
⅝ and 9-16 by Nos. 11 and 12	2 10
½ by ⅛ to 3-16 inch	2 20
½ by Nos. 11 and 12	2 25

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	1 50
⅞ inch, " " " " 13 and 14	1 60
¾ inch, " " " " 11 and 12	1 65
¾ inch, " " " " 13 and 14	1 75

Sheet Iron.

No. 10	1 45
No. 12	1 55
No. 14	1 65
No. 15-17	1 75
No. 18	1 90
No. 20	2 15
No. 22-24	2 15
No. 25-26	2 25
No. 27	2 35

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 45
Shell	1 60
Flange	1 70
Marine Flange	2 00
Fire Box	2 50

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	08
9-16 to ⅞ in. "	08

Soft Steel Bars, Light

LOW PRICES

do not always influence business. Some brands of goods are undesirable as a **Gift.**

Write us for our catalogue and send us a sample order and see if there is not **Economy** in using **First Quality** goods at Fair Prices.

Structural Shapes, Rails.

TIN PLATES,
CALVANIZED SHEETS,
CORRUGATED IRON,
BLACK PLATES,

Sheet Iron and Steel, any finish, patent leveled or common.

Aetna Standard Iron & Steel Co.,
BRIDGEPORT, OHIO.

ROBERTS STEEL CHAIN BELTING CO., Pittsburg, Pa.

Elevating and Conveying Machinery

For Handling all kinds of materials.

Special Wrought and Steel Chains of every description; Coil and Cable Chains; Chain Haulages for Coal Mines; Sprocket Wheels; Complete Coal and Ashes Handling Plants; Wire Rope Haulages and Wire Rope.

W. H. COFFMAN COKE CO.

BLUEFIELD, W. VA.

GENERAL FACTORS AND SHIPPERS OF

POCAHONTAS FLAT-TOP COKE.

So low in ash that it requires no fluxing for foundry purposes. Our foundry and furnace coke was awarded the first premium at the World's Fair in 1893.

AVERAGE ANALYSIS OF COKE.

Moisture	00.196	Sulphur	00.677
Fixed Carbon	93.625	Ash	05.004
Volatile Matter	00.494		

Foundry, Furnace and all sizes of crushed coke. Guaranteed lower in Sulphur than any other commercial coke

STEEL CASTINGS

FROM 10 LBS. UPWARD.

Made from Best Open-Hearth Steel.

ALSO SAND ROLLS AND CAST-IRON PINIONS.

SEND FOR ESTIMATES.

THE JOHNSON COMPANY, Johnstown, Pa.

GARDEN CITY FOUNDRY CO.

INCORPORATED.

Successors to TURNER, DICKINSON & CO.

Armitage and Central Avenues, Station G, Chicago, Ill.

FRICTION CLUTCHES, HANGERS, PILLOW BLOCKS & PULLEYS.

Large Stocks on Hand. Shipments Promptly Made.

. . '96 JENKINS '96 . .

Is the Perfection of Joint Packing. Instantaneous. Does not Squeeze Out and not Necessary to follow up Joint. We guarantee it to last for years on any and all pressures of steam or any kind of joint where packing is required. Does **not Rot, Burn or Blow Out,** therefore the best for all purposes. Call for and insist on having **'96 JENKINS '96** stamped like cut.

Jenkins Bros., New York, Boston, Philadelphia Chicago.

7-16 to ⅜ and 2⅛ to 3 in.	.09
3⅛ to 4 in.	.09½
⅜ to 11-16 and 4⅛	.10
⅛ to 6 in.	.10½
¾ to 9-32 and 6⅛ to 7 in.	.11
7 ⅛ in	.13

Flats.

	cts. lbs
2 to 9-16 in. wide by 2 to ⅜ thick	.8

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 50
Open-hearth Tire	"	1 80
Open-hearth Spring	"	2 20
Sleigh Shoe	"	1 90
Toe Calk	"	2 10
Cutter Shoes, tapered and bent	"	2 20

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	13½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 30
Bridge ½, ⅝, 11-16 and ¾ inch diam.	3 00

Wrought Pipe and Boiler Tubes.

Lap weld black, base	dis. 65
Butt " " "	dis.
Lap " galv. "	dis. 52½
Butt " " "	dis. 50
Boiler tubes 2½" and smaller	dis. 62½
Boiler tubes 2½" and larger	dis. 65
Casing screw and socket joint	dis. 52½
Casing inserted joint	dis. 47½

MACHINERY SUPPLY MARKET.

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single,	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis
Horton's Universal	dis
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis
" " Gear Cutters	dis

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1½"	dis 50&10
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

SHIFFLER BRIDGE COMPANY,

BUILDING DEPARTMENT.

SPECIALTIES: STEEL AND IRON BUILDINGS FOR ROLLING-MILLS TIN PLATE PLANTS, STEEL WORKS, FOUNDRIES, FACTORIES, ROOF TRUSSES, GIRDERS, COLUMNS, BEAMS, CORRUGATED IRON, ETC.

Main Office and Works:
48th Street and A. V. Ry.
PITTSBURG, PA.

Branch Offices:
1123 Betz Building, Philadelphia, Pa.
65 Dexter Building, Chicago, Ill.
228 Lumber Exchange, Minneapolis, Minn.

CAMBRIA STEEL.

Steel Rails, Blooms, Billets, Bars, Axles, Angles, Channels, Forgings, Locomotive Car and Structural Steel.

CAMBRIA IRON COMPANY, S. W. Cor. 15th and Market Sts., opp. Penna. R. R. Station, Philadelphia; Chicago office, Western Union Building; New York office, (for Rails and Axles), 33 Wall St.; Cleveland office, Bourne, Fuller & Co. Works at Johnstown, Pa.

GAUTIER STEEL DEPARTMENT OF CAMBRIA IRON CO.,

JOHNSTOWN, PA.

MERCHANT BAR STEEL: Including Tire, Toe Calk, Machinery, Carriage Spring, Railroad Spring, Hoe, Rake, Fork, etc.
AGRICULTURAL STEEL AND SHAPES: Finger Bars, Knife Backs, Rake Teeth, Bundle Carrier Teeth, Tedder Forks and Springs, Spring Harrow Teeth, Harrow (Drag) Teeth, Seat Springs, etc.
PLOW STEEL: Flat and Finished Plow Shapes, Digger Blades, Slabs (Penn and Pernot), Hammered Lay, Rolled Lay, etc.

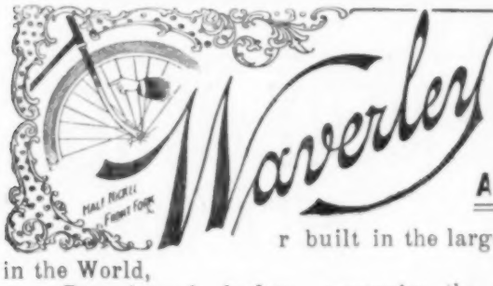
Cold Rolled Steel Shafting. **Steel Harrow Discs.** **Cambria Link Barb Wire.**

New York Office, 102 Chambers St. | Philadelphia Office, 611 Phila. Bourse, | Chicago Office, 209 Western Union Bldg. | Atlanta Office, 325 Decatur st.

STUART FIRE BRICK CO.

MANUFACTURERS OF
Silica Brick
For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER
Office, Room 21, Conestoga Bldg., Cor. Wood and Water Sts., PITTSBURG, PA.

COMBINE SAFETY WATER TUBE BOILER
L. M. MOYES, MANUFACTURER, PHILADELPHIA, PA.



r built in the largest and best equipped factory in the World,

Experienced dealers recognize the importance of handling a standard line of wheels, something that has an established reputation and that everybody knows. It is uphill work trying to sell unknown wheels. It is no work at all to sell the Waverleys. Only dealers who handle them know how easily they are sold. You can make more money with less labor selling Waverleys than any other bicycle,

Write for catalogue and terms. Our prices will interest you.

INDIANA BICYCLE CO.,

General Office and Works, Indianapolis, Ind.
Eastern Wholesale Branch, 339 Broadway, New York City, N. Y.

Emery.

	No. 4 to 46 gr.	No. 54 to 150 gr.	Flour, C. F. FF.
Kegs, ℔ lb	4½c	5 c	2½c
½ kegs ℔ lb	4¾c	5¼c	2¾c
¼ kegs ℔ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co. ..... dis 50@50&5
H. H. Barton ..... dis 50@50&5

Emery Wheels.

Detroit ..... dis 60@70
Norton's ..... dis 60@70
Grant ..... dis 60@70
Sterling ..... dis 60@70
Celluloid ..... dis 10&33⅓
Northampton ..... dis 50
Crystal ..... dis 65@70
Vitrified ..... dis 60@70
Vulcanite ..... dis 60&10
Hamden ..... dis 60&10@75
Cyclone ..... dis 60@60&10

Files.

Arcade ..... dis 60&10@60&10&10
Nicholson ..... dis 60&10@60&10&10
" X. F. ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
McClellan ..... dis 60&10@60&10&10
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
Industry File Works Hand Cut ..... dis 50

Hammers.

P. S. W ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs 13c
" " " " over 5 lbs 10c

Jack Screws.

Illinois Bolt Co. list ..... dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¾	3½
Hexagon	15½	11½	8½	6	5½	5¼	
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ℔ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887 ..... dis 85
Standard Penny Nails, ℔ keg card rate
Car lots $2.25
Less than car lots $2.35

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz ..... dis 10@10&10

Picks.

Railroads, 5 to 6 lbs ..... $12 dis 60
" 6 to 7 lbs ..... $13 dis 60

Pulleys.

Iron Pulleys, Walker List ..... dis 50
Medart Pulleys ..... dis 50
Split Wood Pulleys ..... dis 55@60

Pulley Blocks.

Moore's Anti-Friction Differential Chain Pulley Block ..... dis 20

Rivets.

Iron, Thousand, list November 1, 1894 ..... dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894 ..... dis 60@65
Copper ..... dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list ..... dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 55
Pulley Taps ..... dis 40

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 15@20
Howard ..... dis 35

Wire.

New List, Apr. 9, 1894

Brass ..... dis 40
Copper ..... dis 40
Bright and annealed, Nos. 0@18 ..... dis 70&10@75
" " Nos. 19@26 ..... dis 75@75&5
" " Nos. 27@36 ..... dis 75&10&5
Coppered Nos. 0 to 18, market list ..... dis 70@70&5
Galvanized Nos. 0 to 18 " " ..... dis65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... 95c ℔ lb dis 30

Wrenches.

Coe's genuine ..... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanic's ..... dis 55&10&5
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 65
Billings & Spencer's Drop Forged ..... dis 25
William's " " ..... dis 25
Alligator " dis40

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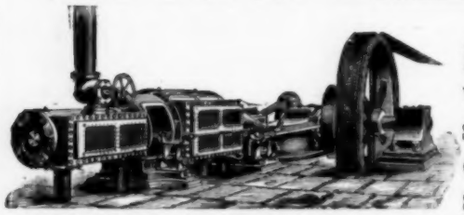

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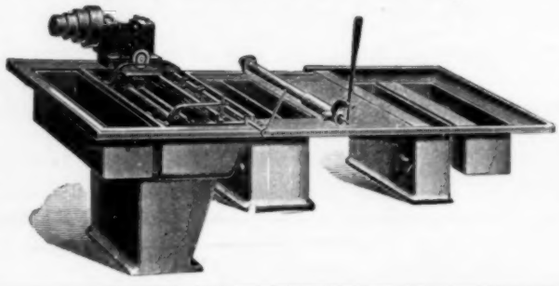

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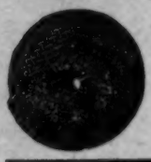

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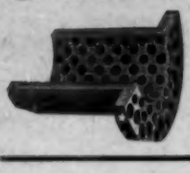

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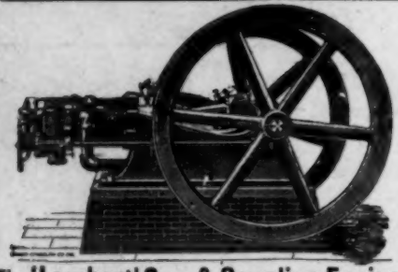

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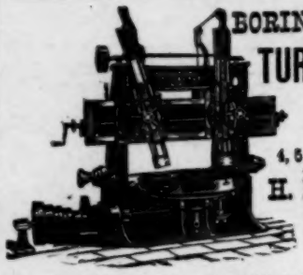

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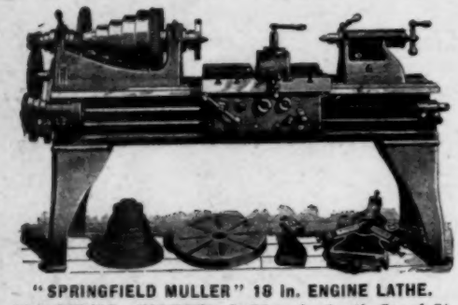

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